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FLOOD INSURANCE STUDY

LIBERTY COUNTY, TEXAS
UNINCORPORATED AREAS

SEPTEMBER 30, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 480438

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
UNINCORPORATED AREAS OF LIBERTY COUNTY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the unincorporated areas of Liberty County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for portions of this study were prepared by the U. S. Soil Conservation Service (SCS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-8-77. This work was completed in April 1985. The hydrologic and hydraulic analyses for the remaining portions of this study were prepared by the Water Resources Division of the U. S. Geological Survey (USGS) for FEMA, under Inter-Agency Agreement No. EMW-E-1154. This work was completed in June 1986. Additional flooding information for this study was obtained from the Flood Insurance Study for the unincorporated areas of Harris County, Texas, prepared by the Harris County Flood Control District (HCFCD).

1.3 Coordination

In April 1983, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the SCS, and Liberty County to identify the streams to be studied by detailed

methods. An intermediate meeting was held in May 1983 with representatives of FEMA, the SCS, and the USGS. Results of the hydrologic analyses were coordinated with the U. S. Army Corps of Engineers (COE). On November 5, 1986, a final CCO meeting was held with representatives of FEMA, the county, the USGS, and the SCS to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Liberty County, Texas. The following areas are not included in this study: the City of Cleveland, the Town of Daisetta, the City of Dayton, the City of Liberty, the City of Dayton Lakes, and the City of Plum Grove. The area of study is shown on the Vicinity Map (Figure 1).

The streams studied by detailed methods, along with the study contractor who performed the study, are listed in the following tabulation:

Stream	Study Contractor	Limits of Detailed Study
Batiste Creek	USGS	From its confluence with Willow Creek to approximately 1.8 miles upstream.
Bull Tongue Creek	USGS	From its confluence with Willow Creek to approximately 0.9 mile upstream.
Cedar Bayou	HCFCD	For its entire length along the Liberty County-Harris County boundary.
	USGS	From its upstream county boundary to approximately 0.8 mile upstream of an access road that is approximately 4.4 miles upstream of the county boundary.
Cow Branch	SCS	From its confluence with East Fork San Jacinto River to the upstream county boundary.
East Fork San Jacinto River	SCS	For its entire length within the county.
Hickory Island Gully	USGS	From the downstream county boundary to approximately 4.2 miles upstream of Hatcherville Road.

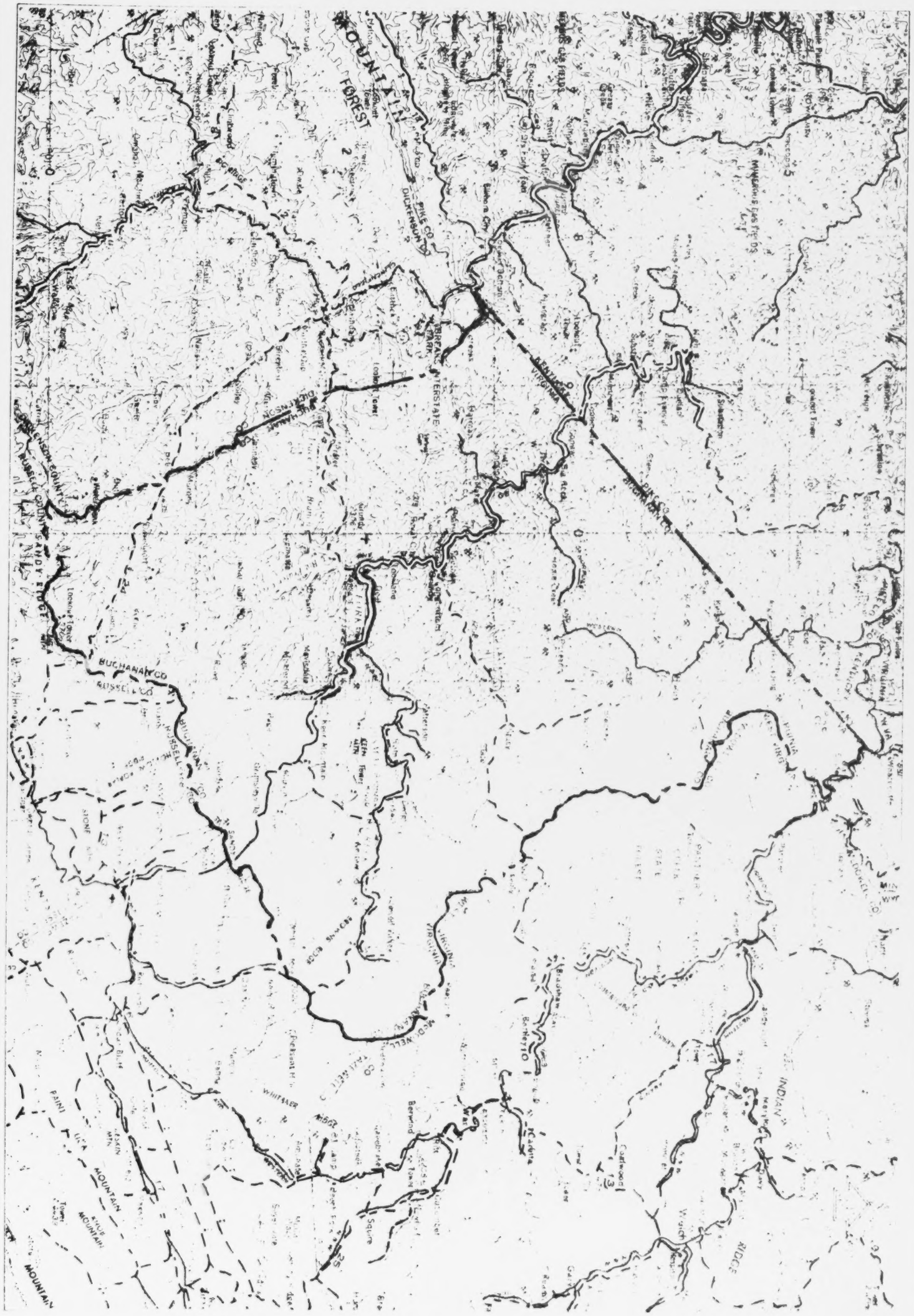


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUCHANAN COUNTY, VA
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

VICINITY MAP

Stream	Study Contractor	Limits of Detailed Study
Luce Bayou	SCS	From the downstream county boundary to the downstream side of FM 1008.
Marsh Branch	SCS	From its confluence with Tarkington Bayou to approximately 1.4 miles upstream of the Atchison, Topeka & Santa Fe Railway.
Marsh Branch Tributary No. 1	SCS	From its confluence with Marsh Branch to approximately 1.1 miles upstream of the Atchison, Topeka & Santa Fe Railway.
Menard Creek	USGS	From its confluence with the Trinity River to the upstream county boundary.
Reese Bayou	SCS	From its confluence with Tarkington Bayou to the county boundary.
Tarkington Bayou	SCS	From its confluence with Luce Bayou to the county boundary.
Trinity River	USGS	From the downstream county boundary to approximately 5.7 miles upstream of the Atchison, Topeka & Santa Fe Railway.
Turtle Bayou	USGS	From approximately 1,200 feet upstream of the county boundary to approximately 5.4 miles upstream of the county boundary.
Twin Ditches	USGS	From approximately 0.7 mile downstream of Atascocita Road to approximately 1.2 miles downstream of Atascocita Road.
Upper-East Twin Ditch	USGS	From its confluence with Twin Ditches to approximately 80 feet upstream of an access road that is approximately 0.9 mile upstream of its confluence with Twin Ditches.
East-West Dayton Ditch	USGS	From approximately 100 feet upstream of FM 1960 to approximately 1.4 miles upstream of FM 1960.

Stream	Study Contractor	Limits of Detailed Study
West-West Dayton Ditch	USGS	From approximately 100 feet upstream of FM 1960 to a point approximately 1.4 miles upstream.
Whiskey Branch	SCS	From its confluence with East Fork San Jacinto River to the county boundary.
Willow Creek	USGS	From approximately 2.4 miles downstream of Hogpen Road to approximately 2.3 miles upstream of the confluence of Bull Tongue Creek.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through June 1991.

The following flooding sources were studied by approximate methods: Arizona Creek, Bee Branch, Big Caney Creek, Blau Gully, Brooks Creek, Buck Gully, Camp Branch, Cherry Creek, Cow Island Bayou, Cotton Creek, Crooked Bayou, East Fork Double Bayou, Felicia Creek, Gaylor Creek, Horsepen Gully, Jerome Slough, Labitt Creek, Lee Gully, Little Caney Creek, Long Branch, Long Island Creek, Mayhaw Creek, Merchant Slough, Neds Gully, Negro Gully, the Old River, Orange Branch, Pignut Gully, Pine Island Bayou, Shiloh Creek, Six-Ten Slough, Spindletop Bayou, Spinks Creek, Turkey Creek, Walker Marsh, West Branch Devers Canal, West End Slough, Whites Bayou, Willis Marsh, Willow Creek, and the remaining portions of Batiste Creek, Bull Tongue Creek, Cow Branch, Luce Bayou, Marsh Branch, Marsh Branch Tributary No. 1, the Trinity River, Turtle Bayou, East-West Dayton Ditch, and West-West Dayton Ditch. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Liberty County.

2.2 Community Description

Liberty County is located in the coastal plains of southeast Texas. It is bordered by the unincorporated areas of San Jacinto and Polk Counties to the north, the unincorporated areas of Hardin and Jefferson Counties to the east, the unincorporated areas of Chambers County to the south, and the unincorporated areas of Harris and Montgomery Counties to the west. The City of Liberty, which is the county seat, is located approximately 40 miles northeast of the Houston metropolitan area. Liberty County covers an area of approximately 1,170 square miles, and had a 1980 population of 47,088 (Reference 1).

Only a small percentage of Liberty County is developed, with the remainder of the land being woods or agriculture. The economy of the county is supported by agriculture, agri-business, chemical plants, varied manufacturing, forest industries, and tourism. In 1980, the tax value of the county was over $1.4 billion (Reference 2).

The county is bisected by the Trinity River, which originates in north-central Texas and flows south, meandering across Liberty County on its way to the Gulf of Mexico. The river has a channel length of 550 miles and a drainage area of 17,969 square miles at its mouth. The Trinity River basin contains more large cities and has a greater population and industrial development than any other river basin in Texas (Reference 3). On the lower coastal plain, there is a large use of its water for rice irrigation. In Liberty County, the floodplain width of the Trinity River varies from slightly under 3 miles to over 7 miles.

Menard Creek is the largest tributary to the Trinity River in Liberty County. Menard Creek has a drainage area of 167 square miles and is located in the northeastern part of the county. Big Creek, another tributary, enters the Trinity River in the north-central part of Liberty County and has a drainage area of 96.4 square miles. Other stream systems that drain portions of Liberty County include the San Jacinto River and Cedar Bayou in the western part of the county, Turtle Bayou in the southeast, and Willow Creek in the east.

The major crops grown within the county include small grains and forage sorghum. Coastal bermuda, legumes, and paspalums are the primary species being managed on pasture land (Reference 4). The major commercial pine trees are loblolly, shortleaf, longleaf, and slash. Hardwoods associated with these species are primarily sweetgum and oaks. Ground cover is sparse under the dense overstory.

Hardwoods are the dominant species along the stream courses and in the overflow bottom lands. Major overstory species are maple, hickory, and various species of oaks and gums. Understory species include yaupon, American beauty berry, haws, holly, dogwood, grape, and greenbriar. The vegetation in the open areas within these forests are primarily herbaceous plants, principally little bluestem, Indiangrass, paspalums, panicums, lovegrass, and many species of forbs (References 4). Soils within the county are composed of sandy loam and black clay.

The climate is humid, subtropical with mild winters and hot, humid summers. Average temperatures range from 49.9 degrees Fahrenheit (^{o}F) in January to 83.1^{o}F in July. The average annual temperature is 68.5^{o}F. The average annual precipitation is 49.75 inches and is fairly uniformly distributed throughout the year (Reference 5).

2.3 Principal Flood Problems

Thunderstorms occur frequently in Liberty County during the spring and summer. Long-duration, low-intensity storms triggered by continental polar fronts moving in a southern direction occur during the fall and winter. Some of the heaviest rainfall occurs in late summer and early fall as a result of hurricanes moving inland from the Gulf of Mexico. Individual storms that cause serious flooding may occur during any season but are most frequent in the spring.

Large drainage areas of streams within the county, coupled with flat topography, result in slow runoff and long duration flood concentrations. The terrain in the southern half of Liberty County is typical of the Coastal Plains with gentle slopes and low relief and is especially vulnerable to flooding caused by overland flow or sheet flow. This flooding, although usually shallow, may cover a large portion of the county following high intensity rainstorms. Small culverts and bridges under roads and railroads aggravate the flooding problems in the county. Flooding commonly occurs along portions of the streams studied. Small overflows occur during most years and cause minor damage. Larger floods, with potential for significant damage, occur when the county receives a large amount of rain within a short period, such as 8.4 inches of rainfall in 24 hours. Records indicate that the county has a 10 percent chance of this rainfall occurring in any given year (Reference 6). Flooding throughout the county has closed roads on numerous occasions. These roads may be closed for several days at a time.

Moderate flooding is common along the Trinity River in Liberty County, and the flood of May 1942 was the largest flood to occur since 1903. The peak discharge from the 1942 storm was 114,000 cubic feet per second (at an elevation of 27.16 feet) and has an estimated recurrence interval of 60 years.

The last significant floods in the county occurred on August 19, 1983, and September 20, 1979. The August 1983 and September 1979 storms produced 4.99 and 5.31 inches of rainfall at the Cleveland gage, respectively (References 7 and 8). Serious flooding has occurred in the county in 1940, 1960, and 1973. The 1960 rainfall was produced by Hurricane Carla.

Gaging stations are located on the Trinity River at Liberty and Romayer, and on the East Fork San Jacinto River at Cleveland.

2.4 Flood Protection Measures

There are 26 major reservoirs existing on the Trinity River and its major tributaries upstream from Liberty County (Reference 3). Total allocated flood-control storage in these projects is over 1.3

million acre-feet. In addition, the county sets the floor elevation for all new structures. This measure is a significant aid in the prevention of flood damages in the areas vulnerable to shallow flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

For Batiste Creek, Bull Tongue Creek, the portion of Cedar Bayou from its upstream county boundary to approximately 0.8 mile upstream of an access road that is approximately 4.4 miles upstream of the county boundary, Hickory Island Gully, Menard Creek, Turtle Bayou, Twin Ditches, Upper-East Twin Ditch, East-West Dayton Ditch, West-West Dayton Ditch, and Willow Creek, flood frequency curves for the 10-, 50-, and 100-year floods were determined from regression equations developed through a regional analysis of stream flow data conducted by the USGS (Reference 9). The 500-year frequency curves were determined by extrapolation of a line fit to the values for the 2-, 5-, 10-, 25-, 50-, and 100-year floods plotted on probability paper. USGS Region 1 equations were applicable to the following streams located in the southern half of the county: Batiste Creek, Bull Tongue Creek, Cedar Bayou, Hickory Island Gully, Turtle Bayou,

Upper-East Twin Ditch, East-West Dayton Ditch, West-West Dayton Ditch, and Willow Creek (Reference 9). USGS Regions 1 and 2 equations, with equal weight given to each, were applicable to Menard Creek, located in the northeastern part of the county (Reference 9).

For the portion of Cedar Bayou along the Liberty County-Harris County boundary, the flood discharges were developed by the HCFCD using the COE HEC-1 flood hydrograph computer program (Reference 10).

For Cow Branch, the East Fork San Jacinto River, Luce Bayou, Marsh Branch, Marsh Branch Tributary No. 1, Reese Bayou, Tarkington Bayou, and Whiskey Branch, hydrologic evaluations were based on synthetic frequency methods developed by the SCS. Rainfall frequency data were obtained from Technical Paper No. 40 (Reference 6). Values greater than the 100-year frequency event were determined by extrapolation of data on standard log-log paper. Peak discharge values for various frequencies were determined using SCS Technical Release No. 20 (Reference 11).

To determine the peak discharges for the Trinity River, two sets of discharge values were considered. One set was furnished by the Fort Worth District of the COE. The second set was determined by an analysis of annual peak discharge records for Liberty and Romayer stream gaging stations (References 12, 13, and 14). No significant differences were noted between the two set of discharge values; therefore, those furnished by the COE for the Liberty gaging station were used. Because large floods on the Trinity River will likely result from releases from Livingston Reservoir located approximately 25 miles upstream from Liberty County, the discharge values were held constant through the entire reach.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges." In some cases, discharges are attenuated in the downstream direction due to storage in the overbanks.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BATISTE CREEK					
Approximately 1,600 feet upstream of confluence with Willow Creek	74.2	3,740	6,080	7,050	9,100

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BULL TONGUE CREEK					
Approximately 1,100 feet upstream of confluence with Willow Creek	4.7	501	690	756	880
Approximately 0.9 mile upstream of confluence with Willow Creek	4.3	430	572	617	710
CEDAR BAYOU					
Upstream of confluence of Adlong Ditch	77.41	4,400	6,700	8,000	11,000
Approximately 100 feet downstream of U. S. Route 90	64.98	3,910	6,100	7,220	10,000
At upstream county boundary	26.6	2,140	3,280	4,370	6,300
Approximately 1.3 miles upstream of upstream county boundary	25.4	1,990	3,200	3,830	5,290
Approximately 1.4 miles upstream of upstream county boundary	23.0	1,970	3,180	3,800	5,220
Approximately 2.2 miles upstream of upstream county boundary	22.6	1,900	3,070	3,560	4,800
Approximately 0.7 mile upstream of access road, approximately 3.6 miles upstream of upstream county boundary	18.2	1,660	2,670	3,080	4,150
Approximately 0.8 mile upstream of access road, approximately 3.7 miles upstream of upstream county boundary	14.1	1,340	2,100	2,410	3,300
Approximately 2,000 feet downstream of access road, approximately 4.0 miles upstream of upstream county boundary	6.6	764	1,140	1,290	1,620

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
CEDAR BAYOU (continued)					
Approximately 0.8 mile upstream of access road, approximately 5.2 miles upstream of upstream county boundary	5.2	561	788	868	1,090
COW BRANCH					
Approximately 1.2 miles upstream of confluence with East Fork San Jacinto River	4.16	1,267	2,725	3,580	6,051
Approximately 1.9 miles upstream of confluence with East Fork San Jacinto River	3.92	1,265	2,756	3,628	6,145
Approximately 2.3 miles upstream of confluence with East Fork San Jacinto River	3.64	1,264	2,794	3,689	6,264
EAST FORK SAN JACINTO RIVER					
Approximately 1.4 miles upstream of downstream county boundary	365.78	16,815	38,706	52,361	94,818
At FM 2090	356.95	16,877	38,863	52,541	94,930
Approximately 2.7 miles downstream of U. S. Route 59	340.58	17,531	39,974	53,875	96,080
At State Route 105	325.00	17,879	40,699	54,689	96,721
At upstream county boundary	314.68	17,817	40,626	54,472	95,602
HICKORY ISLAND GULLY					
Approximately 100 feet upstream of county boundary	7.5	860	1,307	1,479	1,810
Approximately 900 feet downstream of Hatcherville Road	7.0	844	1,292	1,465	1,790

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
HICKORY ISLAND GULLY (continued)					
Approximately 2,000 feet upstream of Hatcherville Road	5.6	733	1,115	1,262	1,570
Approximately 4,000 feet upstream of Hatcherville Road	4.8	661	1,001	1,131	1,400
Approximately 1.7 miles upstream of Hatcherville Road	4.1	596	896	1,011	1,270
Approximately 2.1 miles upstream of Hatcherville Road	2.9	466	688	771	940
Approximately 3.1 miles upstream of Hatcherville Road	2.0	358	519	578	700
Approximately 4.2 miles upstream of Hatcherville Road	1.2	249	352	388	465
LUCE BAYOU					
At county boundary	202.41	4,651	11,532	16,796	43,706
At confluence of Tarkington Bayou	168.52	4,686	11,680	16,928	44,140
Approximately 0.9 mile upstream of confluence of Tarkington Bayou	38.91	2,039	4,345	5,673	11,451
At State Route 321	27.48	1,886	4,148	5,719	13,322
Approximately 1.3 miles upstream of State Route 321	15.59	1,126	2,616	3,755	9,472
Approximately 1.7 miles downstream of FM 1008	12.38	1,229	2,806	3,997	9,408
At FM 1008	6.97	954	2,087	2,857	6,461
MARSH BRANCH					
Approximately 0.8 mile upstream of confluence with Tarkington Bayou	32.31	1,355	3,134	4,452	13,084
At State Route 321	24.94	1,178	2,667	3,809	11,309
At Oak Shade Road	15.21	933	2,103	3,094	7,659
At FM 787	10.52	678	1,562	2,239	5,609

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MARSH BRANCH (continued)					
Approximately 1,600 feet upstream of Atchison, Topeka & Santa Fe Railway	7.74	588	1,335	1,896	4,734
Approximately 1.4 miles upstream of Atchison, Topeka & Santa Fe Railway	6.84	598	1,423	2,006	4,823
MARSH BRANCH TRIBUTARY NO. 1					
At FM 787	2.99	212	495	807	2,446
At Atchison, Topeka & Santa Fe Railway	2.19	207	521	859	2,295
At unnamed road approximately 1,600 feet upstream of Atchison, Topeka & Santa Fe Railway	1.64	182	445	681	1,754
Approximately 1.1 miles upstream of Atchison, Topeka & Santa Fe Railway	0.92	127	309	437	1,048
MENARD CREEK					
At FM 2610	162	12,000	22,200	27,200	38,800
At State Route 146	152	11,600	21,500	26,300	37,400
Approximately 1.2 miles upstream of State Route 146	121	10,000	18,300	22,300	31,600
At upstream county boundary	111	9,680	17,800	21,700	30,400
REESE BAYOU					
Approximately 0.9 mile upstream of confluence with Tarkington Bayou	13.70	954	2,146	3,023	8,031
At Atchison, Topeka & Santa Fe Railway	12.29	972	2,166	3,025	7,796
At U. S. Route 59	10.87	943	2,115	2,946	7,364

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
REESE BAYOU (continued)					
Approximately 0.6 mile downstream of county boundary	8.43	814	1,925	2,712	6,398
At county boundary	8.11	815	1,930	2,714	6,484
TARKINGTON BAYOU					
Approximately 0.9 mile upstream of confluence with Luce Bayou	128.78	3,076	7,625	11,305	34,861
At Gulf Road	95.01	3,119	7,737	11,413	32,308
At State Route 321	56.62	2,303	5,758	8,286	21,641
At FM 787	38.08	1,783	4,374	6,243	15,938
Approximately 0.9 mile downstream of county boundary	33.57	1,924	4,695	6,695	16,332
Approximately 900 feet upstream of county boundary	30.92	2,009	4,751	6,687	16,073
TRINITY RIVER					
At U. S. Route 90	17,468	72,000	110,000	127,000	235,000
TURTLE BAYOU					
Approximately 1,200 feet upstream of county boundary	17.6	1,480	2,300	2,630	3,310
Approximately 1.7 miles upstream of county boundary	17.2	1,350	2,110	2,410	3,050
Approximately 2.4 miles upstream of county boundary	12.6	1,240	1,930	2,210	2,810
Approximately 3.5 miles upstream of county boundary	11.3	1,150	1,780	2,030	2,560
Approximately 4.3 miles upstream of county boundary	9.8	1,060	1,650	1,880	2,370
Approximately 5.2 miles upstream of county boundary	9.0	1,010	1,570	1,790	2,210

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TWIN DITCHES					
Approximately 0.8 mile upstream of county boundary	7.55	864	1,310	1,490	1,860
At downstream side of Atascocita Road	6.89	809	1,220	1,380	1,700
At downstream side of access road, approximately 0.9 mile upstream of Atascocita Road	5.71	740	1,130	1,270	1,600
Approximately 1.2 miles upstream of Atascocita Road	5.35	692	1,040	1,180	1,450
UPPER-EAST TWIN DITCH					
Approximately 1.2 miles upstream of Atascocita Road	4.32	565	826	922	1,150
Approximately 1.9 miles upstream of Atascocita Road	3.54	530	788	885	1,100
EAST-WEST DAYTON DITCH					
At FM 1960	1.75	358	532	598	730
Due west of radio tower	1.39	308	454	508	610
Approximately 0.9 mile upstream of FM 1960	1.09	263	385	429	520
Approximately 1.4 miles upstream of FM 1960	0.55	159	223	245	295
WEST-WEST DAYTON DITCH					
At FM 1960	1.23	282	414	463	560
Due west of radio tower	0.93	242	356	398	475
Approximately 0.9 mile upstream of FM 1960	0.63	186	274	305	370
WHISKEY BRANCH					
Approximately 0.9 mile upstream of confluence with East Fork San Jacinto River	6.90	566	1,284	1,673	2,602

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
WHISKEY BRANCH (continued)					
At State Route 105	6.32	563	1,281	1,654	2,541
Approximately 1.9 miles upstream of Atchison, Topeka & Santa Fe Railway	5.16	538	1,309	1,771	3,110
At county boundary	4.08	473	1,169	1,594	2,859
WILLOW CREEK					
Approximately 1.5 miles downstream of Hogpen Road	90.4	4,300	7,050	8,200	10,700
Approximately 430 feet upstream of confluence of Batiste Creek	12.9	1,240	1,930	2,200	2,900
Approximately 1,500 feet upstream of confluence of Batiste Creek	5.66	690	1,030	1,160	1,400
Approximately 0.8 mile upstream of confluence of Bull Tongue Creek	4.92	660	1,000	1,130	1,360
Approximately 1.4 miles upstream of confluence of Bull Tongue Creek	3.49	550	830	940	1,170
At access road, approximately 2.0 miles upstream of confluence of Bull Tongue Creek	2.42	470	720	820	1,000
Approximately 2.3 miles upstream of confluence of Bull Tongue Creek	1.65	380	590	660	820

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Valley cross sections for the Trinity River were obtained from the COE. Additional cross sections were surveyed at some highway and railway crossings. Cross sections obtained from the COE were surveyed in the vicinity of the main channel and extended to both banks based on USGS topographic maps at a scale of 1:24,000 with contour intervals of 5 and 10 feet (Reference 15). Cross sections for the remaining streams studied by detailed methods were obtained from field surveys. Cross sections were located above and below bridges in order to compute significant backwater effects.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals for Batiste Creek, Bull Tongue Creek, Cedar Bayou, Hickory Island Gully, Menard Creek, the Trinity River, Turtle Bayou, Twin Ditches, Upper-East Twin Ditch, East-West Dayton Ditch, West-West Dayton Ditch, and Willow Creek were computed using the COE HEC-2 step-backwater computer program (Reference 16). The normal and special bridge routines in the HEC-2 program were not applicable for roadway crossings where multiple bridges exist, such as those on the Trinity River. For these crossings, a valley cross-section along the centerline of the road was used, along with an approach and an exit cross-section. Because of the low-water velocities and low water-surface slopes, the water-surface elevations computed using this procedure should be reliable.

Water-surface elevations of floods of the selected recurrence intervals for Cow Branch, the East Fork San Jacinto River, Luce Bayou, Marsh Branch, Marsh Branch Tributary No. 1, Reese Bayou, Tarkington Bayou, and Whiskey Branch were computed using the SCS WSP-2 computer program (Reference 17).

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

The starting water-surface elevations for Cedar Bayou and Luce Bayou were obtained from the Flood Insurance Study for the unincorporated areas of Harris County (Reference 18). The starting water-surface elevations for the East Fork San Jacinto River were obtained from the Flood Insurance Study for the unincorporated areas of Montgomery County (Reference 19). For the Trinity River, the starting water-surface elevations were obtained from computer printouts of backwater computations furnished by the COE. For the remaining streams studied by detailed methods, the starting water-surface elevations were determined using the slope/area method.

Roughness coefficients (Manning's "n") were estimated by field inspection. The channel and overbank "n" values for the streams studied by detailed methods are shown in the following tabulation:

Stream	Channel "n"	Overbank "n"
Batiste Creek	0.065-0.080	0.070-0.095
Bull Tongue Creek	0.080-0.090	0.095
Cedar Bayou	0.040-0.065	0.050-0.120
Cow Branch	0.060	0.130
East Fork San Jacinto River	0.050-0.060	0.140-0.150
Hickory Island Gully	0.045-0.050	0.065-0.080
Luce Bayou	0.060-0.085	0.120-0.150
Marsh Branch	0.065-0.075	0.150
Marsh Branch Tributary No. 1	0.065	0.150
Menard Creek	0.040-0.090	0.030-0.100
Reese Bayou	0.050-0.075	0.140-0.150
Tarkington Bayou	0.065-0.075	0.140-0.150
Trinity River	0.040-0.060	0.070-0.250
Turtle Bayou	0.055-0.085	0.075-0.090
Twin Ditches	0.060-0.085	0.060-0.085
Upper-East Twin Ditch	0.060	0.085
East-West Dayton Ditch	0.080	0.040-0.080
West-West Dayton Ditch	0.080	0.040-0.080
Whiskey Branch	0.050-0.055	0.130-0.150
Willow Creek	0.065-0.090	0.070-0.095

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3). The magnitude of land-surface subsidence, known to have occurred in parts of Liberty County, was not investigated in this study.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with contour intervals of 5 and 10 feet (Reference 15).

For the streams studied by approximate methods, the boundary of the 100-year flood was delineated using the Flood Hazard Boundary Map for the unincorporated areas of Liberty County (Reference 20).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

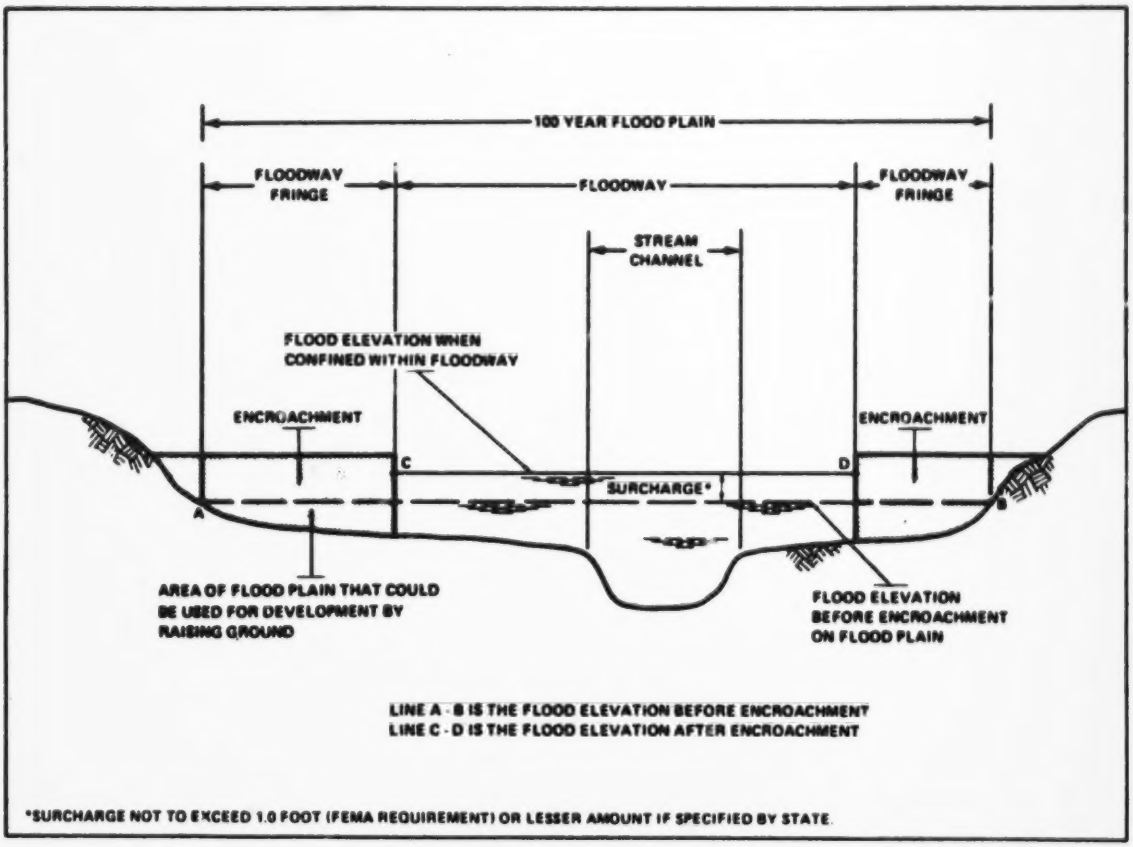
For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for Cedar Bayou, the East Fork San Jacinto River, Hickory Island Gully, Menard Creek, Reese Bayou, and the Trinity River extend beyond the corporate limits.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.



FLOODWAY SCHEMATIC Figure 2

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Batiste Creek								
A	1,620[1]	1,356	5,028	1.4	49.9	49.9	50.8	0.9
B	3,770[1]	928	6,264	1.1	51.4	51.4	52.1	0.7
C	6,130[1]	1,100	4,410	1.6	52.6	52.6	53.3	0.7
D	9,420[1]	1,200	8,217	0.9	53.7	53.7	54.6	0.9
Bull Tongue Creek								
A	1,125[1]	266	799	0.9	49.6	46.7[4]	47.6	0.9
B	2,895[1]	200	738	1.0	49.6	48.1[4]	48.9	0.8
C	4,665[1]	100	291	2.1	50.4	50.4	51.2	0.8
Cedar Bayou								
A	130,671[2]	1,530[3]	7,294	1.6	37.6	37.6	38.6	1.0
B	134,671[2]	2,330[3]	9,645	1.2	40.6	40.6	41.6	1.0
C	138,671[2]	2,830[3]	11,658	0.9	42.3	42.3	43.3	1.0
D	142,471[2]	1,985[3]	9,406	0.9	44.2	44.2	45.2	1.0
E	148,083[2]	726[3]	6,035	1.3	44.7	44.7	45.7	1.0
F	154,083[2]	380[3]	2,216	3.4	48.3	48.3	49.3	1.0
G	158,583[2]	550[3]	2,738	2.8	52.0	52.0	53.0	1.0
H	169,083[2]	940[3]	4,975	1.5	57.3	57.3	58.1	0.8
I	175,083[2]	1,150[3]	7,900	0.9	60.9	60.9	61.8	0.9
J	181,083[2]	1,684[3]	7,762	0.8	62.6	62.6	63.6	1.0
K	185,583[2]	2,855[3]	12,170	0.5	63.4	63.4	64.2	0.8
L	210,333[2]	437[3]	1,673	2.6	71.7	71.7	72.7	1.0

[1]Feet above confluence with Willow Creek

[2]Feet above confluence with Galveston Bay

[3]This width extends beyond county boundary

[4]Elevation computed without consideration of of backwater effects from Willow Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

BATISTE CREEK-BULL TONGUE CREEK-CEDAR BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Cedar Bayou (continued)								
M	212,033[1]	548	2,237	1.9	72.9	72.9	73.9	1.0
N	214,833[1]	844	3,055	1.3	74.0	74.0	75.0	1.0
O	216,933[1]	805	2,918	1.3	74.6	74.6	75.6	1.0
P	217,533[1]	838	2,885	1.3	74.8	74.8	75.8	1.0
Q	219,133[1]	705	2,470	1.5	75.4	75.4	76.4	1.0
R	221,933[1]	713	2,307	1.5	76.5	76.5	77.5	1.0
S	224,833[1]	420	1,755	2.0	77.9	77.9	78.9	1.0
T	225,333[1]	682	1,877	1.9	78.2	78.2	79.2	1.0
U	225,653[1]	668	2,284	1.6	78.4	78.4	79.4	1.0
V	226,133[1]	957	3,450	1.0	78.6	78.6	79.6	1.0
W	227,533[1]	1,235	4,571	0.8	78.8	78.8	79.8	1.0
X	229,033[1]	534	2,608	1.2	79.0	79.0	80.0	1.0
Y	229,633[1]	736	3,051	0.8	79.1	79.1	80.1	1.0
Z	231,533[1]	400	1,043	1.2	79.5	79.5	80.4	0.9
AA	235,373[1]	175	829	1.6	81.0	81.0	81.9	0.9
AB	237,473[1]	85	444	2.0	81.9	81.9	82.9	1.0
Cow Branch								
A	6,200[2]	143	1,063	3.4	101.3	99.8[3]	100.8	1.0
B	9,800[2]	268	1,647	2.2	106.1	106.1	107.1	1.0
C	12,000[2]	107	817	4.5	111.3	111.3	112.3	1.0

[1]Feet above confluence with Galveston Bay

[2]Feet above confluence with East Fork San Jacinto River

[3]Elevation computed without consideration of backwater effects from East Fork San Jacinto River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

CEDAR BAYOU - COW BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
East Fork San Jacinto River								
A	7,267	1,877[2]	24,234	2.2	93.3	93.3	94.3	1.0
B	11,062	2,502[2]	34,701	1.5	94.7	94.7	95.7	1.0
C	12,362	3,242[2]	37,612	1.4	95.4	95.4	96.4	1.0
D	14,162	4,616[2]	41,263	1.3	96.2	96.2	97.2	1.0
E	14,302	3,372[2]	34,958	1.5	96.4	96.4	97.4	1.0
F	18,162	1,777[2]	27,138	1.9	98.6	98.6	99.6	1.0
G	22,462	2,753[2]	41,960	1.3	99.7	99.7	100.7	1.0
H	29,062	2,184	29,422	1.8	103.9	103.9	104.9	1.0
I	31,962	2,063	31,763	1.7	105.5	105.5	106.5	1.0
J	35,212	1,561	25,695	2.1	107.3	107.3	108.3	1.0
K	37,362	1,923	30,638	1.8	108.6	108.6	109.6	1.0
L	41,062	1,363	24,243	2.2	111.6	111.6	112.6	1.0
M	43,932	1,942	31,459	1.7	112.9	112.9	113.9	1.0
N	50,312	3,277	38,603	1.4	116.3	116.3	117.3	1.0
O	55,812	3,641	33,884	1.6	119.5	119.5	120.5	1.0
P	63,482	5,867	45,534	1.2	124.2	124.2	125.2	1.0
Q	67,262	6,448	50,541	1.1	125.9	125.9	126.9	1.0
R	71,702	3,332[3]	37,499	1.5	128.1	128.1	129.1	1.0
S	76,262	4,887[3]	43,570	1.3	130.5	130.5	131.5	1.0
T	77,922	5,850[3]	35,224	1.6	132.0	132.0	133.0	1.0
U	78,072	6,060[3]	42,534	1.3	133.2	133.2	134.2	1.0
V	79,752	6,210[3]	46,259	1.2	134.1	134.1	135.1	1.0

[1]Feet from county boundary

[2]This width extends beyond county boundary

[3]Combined East Fork San Jacinto River/Whiskey Branch floodway

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

EAST FORK SAN JACINTO RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
East Fork San Jacinto River (continued)								
W	79,872[1]	5,710[3]	42,669	1.3	134.4	134.4	135.4	1.0
X	84,362[1]	4,928	39,821	1.4	136.3	136.3	137.3	1.0
Y	87,112[1]	5,353	41,910	1.3	137.7	137.7	138.7	1.0
Z	87,782[1]	5,406	45,631	1.2	138.2	138.2	139.2	1.0
AA	90,802[1]	4,968	43,948	1.2	139.7	139.7	140.7	1.0
AB	93,802[1]	6,201	44,648	1.2	141.7	141.7	142.7	1.0
Hickory Island Gully								
A	100[2]	672[4]	1,635	0.9	35.5	35.5	36.3	0.8
B	2,610[2]	820	1,803	0.8	36.3	36.3	37.2	0.9
C	3,350[2]	820	1,871	0.8	36.6	36.6	37.4	0.8
D	3,580[2]	700	1,987	0.7	37.4	37.4	38.2	0.8
E	5,460[2]	650	2,006	0.6	37.7	37.7	38.6	0.9
F	7,550[2]	380	1,071	1.1	38.5	38.5	39.2	0.7
G	9,270[2]	400	1,058	1.1	39.2	39.2	40.0	0.8
H	12,430[2]	130	384	2.6	41.1	41.1	42.1	1.0
I	14,370[2]	82	357	2.2	43.8	43.8	44.1	0.3
J	16,870[2]	80	301	2.6	45.9	45.9	46.7	0.8
K	19,740[2]	80	312	1.9	48.5	48.5	49.4	0.9
L	22,790[2]	82	245	2.4	51.8	51.8	52.0	0.2
M	25,790[2]	100	315	1.2	53.0	53.0	53.6	0.6

[1]Feet from county boundary

[2]Feet above county boundary

[3]Combined East Fork San Jacinto River/Whiskey Branch floodway

[4]This width extends beyond county boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

EAST FORK SAN JACINTO RIVER — HICKORY ISLAND GULLY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Luce Bayou								
A	0	1,230	14,923	1.1	67.3	67.3	68.3	1.0
B	5,500	467	6,758	2.5	71.5	71.5	72.5	1.0
C	10,960	1,773	12,359	1.4	73.8	73.8	74.8	1.0
D	17,670	1,277	13,659	1.2	76.1	76.1	77.1	1.0
E	21,340	622	7,903	2.1	78.5	78.5	79.5	1.0
F	26,040	914	10,909	1.5	80.7	80.7	81.7	1.0
G	31,230	618	8,266	2.0	83.5	83.5	84.5	1.0
H	39,350	953	10,955	1.5	87.6	87.6	88.6	1.0
I	48,030	728	10,098	1.7	91.8	91.8	92.8	1.0
J	52,900	330	3,004	1.9	91.8	87.4[2]	88.4	1.0
K	58,650	1,670	8,792	0.7	91.8	89.8[2]	90.8	1.0
L	63,400	723	5,108	1.1	92.1	92.1	93.1	1.0
M	70,450	1,514	8,638	0.7	95.3	95.3	96.3	1.0
N	73,820	1,813	8,622	0.7	96.8	96.8	97.8	1.0
O	73,990	2,400	10,624	0.5	97.5	97.5	98.5	1.0
P	80,900	1,711	7,385	0.5	99.8	99.8	100.8	1.0
Q	84,650	2,902	9,518	0.4	101.2	101.2	102.2	1.0
R	86,100	3,202	11,250	0.4	101.6	101.6	102.6	1.0
S	90,900	2,450	8,195	0.5	103.0	103.0	104.0	1.0
T	95,250	849	3,114	0.9	109.2	109.2	110.2	1.0
U	99,900	921	3,508	0.8	114.1	114.1	115.1	1.0

[1]Feet above county boundary

[2]Elevation computed without consideration of backwater effects from Tarkington Bayou

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

LUCE BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Marsh Branch								
A	4,100	2,710[2]	5,191	0.9	117.6	115.5[3]	116.5	1.0
B	7,180	2,900[2]	6,266	0.7	120.1	118.3[3]	119.3	1.0
C	7,280	3,120[2]	7,305	0.6	120.3	118.3[3]	119.3	1.0
D	11,080	4,560[2]	7,666	0.6	122.0	120.1[3]	121.1	1.0
E	13,960	6,900[2]	6,504	0.7	123.9	122.1[3]	123.1	1.0
F	20,000	685	4,083	1.0	125.0	125.0	126.0	1.0
G	23,690	723	3,839	1.0	126.5	126.5	127.5	1.0
H	23,880	876	5,102	0.8	127.2	127.2	128.2	1.0
I	30,150	1,204	5,047	0.6	130.5	130.5	131.5	1.0
J	39,100	823	3,223	1.0	138.0	138.0	139.0	1.0
K	44,250	748	3,224	1.0	144.5	144.5	145.5	1.0
L	44,350	726	3,355	0.9	144.7	144.7	145.7	1.0
M	45,550	577	2,941	1.0	145.8	145.8	146.8	1.0
N	47,280	224	1,387	1.6	148.1	148.1	149.1	1.0
O	47,400	314	2,024	1.1	149.1	149.1	150.1	1.0
P	50,130	593	3,042	0.7	150.5	150.5	151.5	1.0
Q	51,940	720	2,769	0.7	152.9	152.9	153.9	1.0
R	57,400	911	2,382	0.8	159.3	159.3	160.3	1.0

[1]Feet above confluence with Tarkington Bayou

[2]Combined Tarkington Bayou/Marsh Branch floodway

[3]Elevation computed without consideration of backwater effects from Tarkington Bayou

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

MARSH BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Marsh Branch Tributary No. 1								
A	4,240	401	916	0.9	148.0	147.7[2]	148.7	1.0
B	4,360	411	981	0.8	148.0	147.9[2]	148.9	1.0
C	10,380	1,155	2,235	0.4	153.2	153.2	154.2	1.0
D	10,530	2,038	6,262	0.1	154.4	154.4	155.4	1.0
E	11,750	388	1,310	0.6	155.1	155.1	156.1	1.0
F	12,140	537	1,562	0.4	155.1	155.1	156.1	1.0
G	16,180	372	908	0.5	157.9	157.9	158.6	0.7

[1]Feet above confluence with Marsh Branch

[2]Elevation computed without consideration of backwater effects from Marsh Branch

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

MARSH BRANCH TRIBUTARY NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Menard Creek								
A	3,700	566	4,777	5.7	78.0	60.8[3]	61.8	1.0
B	5,355	381[2]	3,999	6.8	78.0	69.1[3]	69.9	0.8
C	6,505	471	5,953	4.6	78.0	72.9[3]	73.8	0.9
D	8,175	544	5,690	4.8	78.0	75.5[3]	76.3	0.8
E	10,150	454	5,789	4.7	79.1	79.1	79.9	0.8
F	13,955	791[2]	11,848	2.3	82.7	82.7	83.6	0.9
G	16,700	630	8,474	3.2	84.3	84.3	85.2	0.9
H	19,000	451	5,302	5.1	86.5	86.5	87.5	1.0
I	22,360	283	5,121	5.3	91.8	91.8	92.8	1.0
J	24,200	447	8,497	3.2	93.8	93.8	94.8	1.0
K	25,880	824	15,232	1.8	94.2	94.2	95.2	1.0
L	28,280	503	8,638	3.2	94.8	94.8	95.8	1.0
M	29,075	504	7,699	3.4	95.3	95.3	96.3	1.0
N	32,035	571	10,097	2.6	96.4	96.4	97.4	1.0
O	35,235	677	11,110	2.0	97.9	97.9	98.9	1.0
P	36,535	499	8,086	2.8	98.5	98.5	99.5	1.0
Q	37,985	505	8,151	2.7	99.4	99.4	100.4	1.0
R	39,485	868	12,853	1.7	100.2	100.2	101.2	1.0
S	40,905	414	4,529	4.9	100.8	100.8	101.8	1.0
T	41,185	530	4,920	4.5	101.7	101.7	102.7	1.0
U	43,905	760	9,794	2.3	105.0	105.0	105.8	0.8
V	46,605	363	5,894	3.8	107.2	107.2	108.1	0.9
W	51,675	1,143	14,536	1.5	109.5	109.5	110.4	0.9

[1]Feet above confluence with Trinity River
[2]This width extends beyond county boundary
[3]Elevation computed without consideration of backwater effects from Trinity River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

MENARD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Menard Creek (continued)								
X	52,775[1]	382	5,224	4.3	110.0	110.0	110.9	0.9
Y	53,375[1]	374	4,263	5.2	111.3	111.3	112.2	0.9
Z	53,770[1]	408	5,064	4.4	112.7	112.7	113.6	0.9
AA	55,120[1]	548	7,077	3.2	114.2	114.2	115.1	0.9
AB	56,820[1]	240	3,734	6.0	115.4	115.4	116.2	0.8
AC	59,950[1]	594	9,575	2.3	119.0	119.0	120.0	1.0
AD	60,290[1]	596	9,705	2.2	119.2	119.2	120.2	1.0
Reese Bayou								
A	4,930[2]	458	2,351	1.3	144.7	144.7	145.7	1.0
B	10,640[2]	1,977	5,454	0.6	148.7	148.7	149.7	1.0
C	10,760[2]	2,654	12,016	0.3	150.1	150.1	151.1	1.0
D	12,100[2]	1,594	4,930	0.6	151.1	151.1	152.1	1.0
E	12,200[2]	2,676	8,928	0.3	153.3	153.3	154.3	1.0
F	14,400[2]	326	2,081	1.4	154.9	154.9	155.9	1.0
G	15,670[2]	577[3]	2,944	1.0	156.0	156.0	157.0	1.0
H	15,730[2]	606[3]	3,134	0.9	156.2	156.2	157.2	1.0
I	16,170[2]	451[3]	2,363	1.3	156.6	156.6	157.6	1.0
J	16,230[2]	546[3]	2,700	1.1	156.7	156.7	157.7	1.0
K	17,650[2]	1,175	4,620	0.6	157.3	157.3	158.3	1.0
L	17,850[2]	1,944[3]	6,559	0.5	159.0	159.0	160.0	1.0
M	20,800[2]	305	2,189	1.4	162.5	162.5	163.5	1.0

[1]Feet above confluence with Trinity River
[2]Feet above confluence with Tarkington Bayou
[3]This width extends beyond county boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

MENARD CREEK - REESE BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Reese Bayou (continued)								
N	21,450[1]	700	3,900	0.8	163.0	163.0	164.0	1.0
O	22,475[1]	326	2,146	1.3	164.2	164.2	165.2	1.0
P	23,360[1]	663	3,598	0.8	164.8	164.8	165.8	1.0
Q	23,440[1]	676	3,973	10.7	164.9	164.9	165.9	1.0
R	26,600[1]	418	2,363	1.2	167.8	167.8	168.8	1.0
Tarkington Bayou								
A	4,900[2]	2,178	15,649	0.7	91.8	91.8	92.8	1.0
B	9,880[2]	1,400	12,669	0.9	92.1	92.1	93.1	1.0
C	16,200[2]	2,271	14,237	0.8	94.0	94.0	95.0	1.0
D	19,500[2]	1,591	10,123	1.1	96.0	96.0	97.0	1.0
E	23,250[2]	2,275	12,536	0.9	97.8	97.8	98.8	1.0
F	26,100[2]	1,479	9,544	1.2	99.6	99.6	100.6	1.0
G	32,600[2]	1,364	11,006	1.0	102.4	102.4	103.4	1.0
H	35,600[2]	1,654	10,428	1.1	104.2	104.2	105.2	1.0
I	40,200[2]	1,767	11,232	1.0	107.0	107.0	108.0	1.0
J	44,200[2]	1,296	10,019	1.1	110.0	110.0	111.0	1.0
K	47,450[2]	2,603	14,300	0.8	111.8	111.8	112.8	1.0
L	50,770[2]	2,248	11,873	1.0	114.1	114.1	115.1	1.0
M	55,850[2]	2,710[3]	11,913	1.0	117.6	117.6	118.6	1.0
N	59,190[2]	2,900[3]	13,156	0.9	120.1	120.1	121.1	1.0
O	59,290[2]	3,120[3]	15,157	0.8	120.3	120.3	121.3	1.0

[1]Feet above confluence with Tarkington Bayou

[2]Feet above confluence with Luce Bayou

[3]Combined Tarkington Bayou/Marsh Branch floodway

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

REESE BAYOU - TARKINGTON BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tarkinton Bayou								
P	61,950	4,560[2]	15,147	0.8	122.0	122.0	123.0	1.0
Q	65,250	6,900[2]	19,033	0.6	123.9	123.9	124.9	1.0
R	68,700	2,363	8,973	0.9	127.1	127.1	128.1	1.0
S	72,000	2,241	9,862	0.8	129.6	129.6	130.6	1.0
T	74,485	2,367	8,838	0.9	132.6	132.6	133.6	1.0
U	74,650	1,792	7,995	1.0	133.7	133.7	134.7	1.0
V	79,950	660	5,130	1.6	139.0	139.0	140.0	1.0
W	88,250	1,748	9,792	0.9	143.0	143.0	144.0	1.0
X	93,240	1,223	6,832	0.9	145.4	145.4	146.4	1.0
Y	93,360	1,103	9,152	0.7	146.4	146.4	147.4	1.0
Z	96,050	2,021	8,661	0.7	147.7	147.7	148.7	1.0
AA	96,150	2,566	16,095	0.4	149.1	149.1	150.1	1.0
AB	101,400	1,970	8,529	0.8	151.6	151.6	152.6	1.0
AC	108,100	1,294	6,251	1.1	157.4	157.4	158.4	1.0

[1]Feet above confluence with Luce Bayou
[2]Combined Tarkington Bayou/Marsh Branch floodway

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOODWAY DATA

TARKINGTON BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Trinity River								
A	9,895	19,853	173,816	0.7	15.8	15.8	15.8	0.0
B	40,999	13,914	147,044	0.9	20.0	20.0	20.0	0.0
C	88,859	26,186[2]	247,640	0.5	24.3	24.3	24.3	0.0
D	103,300	31,679[2]	265,648	0.5	25.1	25.1	25.1	0.0
E	125,078	16,015[2]	105,927	1.2	27.0	27.0	27.4	0.4
F	148,160	11,900[2]	97,010	1.3	29.7	29.7	30.5	0.8
G	149,586	10,500[2]	99,488	1.3	30.1	30.1	31.1	1.0
H	161,136	6,000	55,328	2.3	32.3	32.3	33.3	1.0
I	173,662	17,000	149,204	0.9	34.1	34.1	35.1	1.0
J	184,309	19,600	214,011	0.6	34.7	34.7	35.7	1.0
K	186,459	21,130	220,287	0.6	35.1	35.1	36.0	0.9
L	197,581	23,968	236,836	0.5	35.5	35.5	36.5	1.0
M	215,850	23,383	227,165	0.6	36.6	36.6	37.6	1.0
N	234,013	20,826	157,028	0.8	38.5	38.5	39.5	1.0
O	249,167	12,200	85,438	1.5	41.8	41.8	42.7	0.9
P	255,503	18,700	105,890	1.2	44.6	44.6	45.5	0.9
Q	284,226	17,300	143,618	0.9	50.1	50.1	51.0	0.9
R	296,761	13,800	100,064	1.3	53.0	53.0	53.8	0.8
S	298,831	12,800	114,293	1.1	53.6	53.6	54.5	0.9
T	310,941	19,240	165,904	0.8	55.8	55.8	56.8	1.0
U	333,645	18,053	137,804	0.9	58.7	58.7	59.7	1.0
V	351,491	20,291	200,414	0.6	60.7	60.7	61.7	1.0
W	364,163	26,453	206,600	0.6	62.1	62.1	63.1	1.0

[1]Feet above county boundary
[2]This width extends beyond county boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREA)

FLOODWAY DATA

TRINITY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Trinity River (continued)								
X	385,969	26,200	132,864	1.0	65.4	65.4	66.4	1.0
Y	394,839	11,425	46,760	2.7	68.6	68.6	69.6	1.0
Z	403,912	12,470	68,391	1.9	72.1	72.1	73.0	0.9
AA	407,118	12,970	95,621	1.3	73.4	73.4	74.2	0.8
AB	428,158	18,600[2]	136,905	0.9	76.9	76.9	77.7	0.8
AC	436,288	24,500[2]	126,243	1.0	78.1	78.1	79.1	1.0
Turtle Bayou								
A	1,200	653	2,284	1.2	30.5	30.5	31.5	1.0
B	1,800	759	2,567	1.0	30.7	30.7	31.7	1.0
C	2,400	820	2,713	1.0	31.0	31.0	32.0	1.0
D	3,440	988	2,860	0.9	31.4	31.4	32.4	1.0
E	8,890	887	2,755	0.9	33.5	33.5	34.5	1.0
F	12,790	1,168	2,938	0.8	35.0	35.0	36.0	1.0
G	16,090	901	2,448	0.9	36.6	36.6	37.6	1.0
H	18,640	500	1,159	1.8	37.8	37.8	38.8	1.0
I	22,590	600	2,047	0.9	41.1	41.1	42.0	0.9
J	22,740	600	2,080	0.9	41.1	41.1	42.0	0.9
K	25,080	600	1,179	1.6	42.5	42.5	43.3	0.8
L	27,530	999	2,623	0.7	43.8	43.8	44.7	0.9

[1]Feet above county boundary
[2]This width extends beyond county boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

TRINITY RIVER - TURTLE BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Twin Ditches								
A	4,000[1]	785	590	2.5	61.3	61.3	62.3	1.0
B	5,100[1]	685	1,339	1.1	63.0	63.0	63.6	0.6
C	6,400[1]	859	1,247	1.2	64.0	64.0	64.4	0.4
D	7,650[1]	1,310	1,420	1.0	64.7	64.7	65.2	0.5
E	7,750[1]	1,310	1,449	1.0	64.7	64.7	65.2	0.5
F	10,150[1]	1,007	1,442	1.0	65.4	65.4	66.1	0.7
G	12,500[1]	2,338	3,241	0.4	66.1	66.1	66.6	0.5
H	13,900[1]	3,084[3]	1,445	0.8	66.4	66.4	66.9	0.5
Upper East-Twin Ditch								
A	13,900[1]	3,084[3]	445	2.1	66.4	66.4	67.4	1.0
B	14,950[1]	400	669	1.4	68.9	68.9	69.5	0.6
C	16,000[1]	250	467	2.0	70.4	70.4	71.3	0.9
D	17,950[1]	300	788	1.1	72.5	72.5	73.2	0.7
E	18,100[1]	50	328	2.7	73.1	73.1	73.7	0.6
East-West Dayton Ditch								
A	100[2]	700	935	0.6	77.6	77.6	78.6	1.0
B	2,450[2]	700	759	0.7	78.8	78.8	79.7	0.9
C	3,650[2]	697	686	0.7	79.6	79.6	80.5	0.9
D	4,700[2]	700	1,001	0.4	79.9	79.9	80.8	0.9

[1]Feet above county boundary
[2]Feet above FM 1960
[3]Combined Twin Ditches/Upper East-Twin Ditch floodway

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

TWIN DITCHES — UPPER EAST-TWIN DITCH — EAST-WEST DAYTON DITCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE
East-West Dayton Ditch (continued)								
E	5,500[1]	700	469	0.9	80.1	80.1	81.1	1.0
F	6,550[1]	500	482	0.9	81.9	81.9	82.7	0.8
G	7,600[1]	400	639	0.4	82.3	82.3	83.2	0.9
West-West Dayton Ditch								
A	100[1]	1,000	1,482	0.3	77.1	77.1	78.1	1.0
B	2,450[1]	1,000	1,164	0.3	77.6	77.6	78.2	0.6
C	3,300[1]	1,200	554	0.7	77.8	77.8	78.3	0.5
D	4,000[1]	1,197	453	0.9	78.1	78.1	79.1	1.0
E	4,750[1]	999	645	0.5	79.0	79.0	80.0	1.0
F	5,700[1]	1,000	386	0.8	81.0	81.0	81.2	0.2
G	6,700[1]	1,000	356	0.6	82.0	82.0	82.9	0.9
H	7,600[1]	391	327	0.3	82.2	82.2	83.2	1.0
Whiskey Branch								
A	4,480[2]	3,332[3]	1,384	1.2	128.1	118.8[4]	119.8	1.0
B	7,800[2]	4,887[3]	689	2.4	130.5	123.2[4]	124.2	1.0
C	10,280[2]	5,850[3]	415	4.0	132.0	127.0[4]	128.0	1.0
D	10,420[2]	6,060[3]	4,410	0.4	133.2	129.3[4]	130.3	1.0
E	10,825[2]	6,210[3]	2,249	0.7	134.1	129.6[4]	130.6	1.0
F	10,960[2]	5,710[3]	6,063	0.3	134.4	131.3[4]	132.3	1.0

[1]Feet above PM 1960

[2]Feet above confluence with East Fork San Jacinto River

[3]Combined East Fork San Jacinto River/Whiskey Branch floodway

[4]Elevation computed without consideration of backwater effects from East Fork San Jacinto River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

EAST-WEST DAYTON DITCH – WEST-WEST DAYTON DITCH – WHISKEY BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Whiskey Branch (continued)								
G	15,900[1]	270	1,386	1.3	136.2	136.2	137.2	1.0
H	19,440[1]	101	620	2.9	139.5	139.5	140.5	1.0
I	20,900[1]	112	510	3.5	142.5	142.5	143.0	0.5
J	24,780[1]	168	921	1.8	148.3	148.3	149.3	1.0
K	24,920[1]	120	611	2.7	148.7	148.7	149.7	1.0
L	26,300[1]	181	938	1.7	151.2	151.2	152.2	1.0
Willow Creek								
A	32,200[2]	2,449	16,442	0.5	43.8	43.8	44.8	1.0
B	37,120[2]	3,000	8,785	0.9	44.3	44.3	45.3	1.0
C	41,900[2]	3,600	10,784	0.8	45.9	45.9	46.9	1.0
D	44,900[2]	1,812	6,246	1.3	47.7	47.7	48.5	0.8
E	45,140[2]	1,812	6,005	1.4	48.0	48.0	48.8	0.8
F	47,050[2]	2,422	10,614	0.8	48.8	48.8	49.7	0.9
G	48,780[2]	1,900	7,128	0.3	49.4	49.1[3]	50.0	0.9
H	50,020[2]	800	4,289	0.5	49.4	49.2[3]	50.1	0.9
I	52,000[2]	800	3,614	0.6	49.5	49.5	50.3	0.8
J	54,700[2]	700	3,141	0.4	49.8	49.8	50.6	0.8
K	57,600[2]	500	1,628	0.7	50.1	50.1	51.0	0.9
L	60,400[2]	450	1,429	0.7	51.0	51.0	52.0	1.0
M	61,150[2]	200	779	1.2	51.5	51.5	52.3	0.8
N	63,530[2]	250	847	1.1	53.3	53.3	54.2	0.9
O	65,360[2]	250	1,162	0.6	53.8	53.8	54.8	1.0

[1]Feet above confluence with East Fork San Jacinto River

[2]Feet above confuence with Pine Island Bayou

[3]Elevation computed without consideration of backwater effects from Batiste Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOODWAY DATA

WHISKEY BRANCH - WILLOW CREEK

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 2 for certain downstream cross sections of Bull Tongue Creek, Cow Branch, Luce Bayou, Marsh Branch, Marsh Branch Tributary No. 1, Menard Creek, Whiskey Branch, and Willow Creek are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Harris, Montgomery, Hardin, and Chambers Counties (References 18, 19, 21, and 22). The results of this study are not in agreement with the results of the studies for Montgomery, Hardin, and Chambers Counties along Cow Branch, Menard Creek, and the Trinity River, respectively. These differences are due to the more up-to-date information used in this study. All other results in this study are in complete agreement with the results of those studies.

Flood Insurance Studies for the Cities of Dayton, Dayton Lakes, and Liberty are currently being prepared (References 23, 24, and 25). The results of those studies will be in complete agreement with the results of this study.

Due to its more detailed analysis, this study supersedes the Flood Hazard Boundary Map for the unincorporated areas of Liberty County (Reference 20).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201.

9.0 BIBLIOGRAPHY AND REFERENCES

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EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	25	82.69	Standard Texas State Reclamation Department disk, stamped 82 F, in top of northwest concrete pier of Atchison, Topeka & Santa Fe Railway bridge over Trinity River.
RM 2	25	65.20	USC&GS nail and washer on top of silver colored, round bridge guard post on north end of abandoned bridge on north bank of Menard Creek approximately 75.0 feet upstream of FM 2610 bridge over Menard Creek.
RM 3	25	81.53	Nail 1.0 foot above ground in orange and white telephone pole on south bank of Menard Creek at east end of Seven Lake Development, approximately 1.0 mile upstream of FM 2610 bridge over Menard Creek.
RM 4	25	83.79	Nail driven vertically in top edge of wood bridge member near center of abandoned south bridge abutment, approximately 2.0 miles downstream of State Route 146 bridge over Menard Creek.
RM 5	25	96.37	Nail 1.0 foot above ground in 10-inch oak tree, marked with orange and white stripes, 20 feet west of centerline of abandoned road, approximately .68 mile downstream of State Route 146 bridge over Menard Creek.
RM 6	25	103.03	Chiseled square on southwest abutment of State Route 146 bridge over Menard Creek.
RM 7	25	106.48	Railroad spike in base of 10-inch tree, 50 feet north of centerline of gravel road, approximately 0.61 mile east of intersection with State Route 146, approximately 1.3 miles north along State Route 146 from intersection with Atchison, Topeka and Santa Fe Railway at Rye.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 8	25	110.81	Wooden stake and nail in telephone pole, 40 feet east of centerline of road, 400 feet south of intersection with gravel road, 0.47 mile east of intersection with State Route 146, approximately 1.3 miles north along State Route 146 from intersection with Atchison, Topeka and Santa Fe Railway at Rye.
RM 9	25	96.72	Railroad spike in power pole, 20 feet north of centerline of road, 0.76 mile from intersection with gravel road, 0.47 mile east of intersection with State Route 146, approximately 1.3 miles north along State Route 146 from intersection with Atchison, Topeka and Santa Fe Railway at Rye.
RM 10	25	109.00	Nail in utility pole at northeast corner of Y-intersection, 20 feet north of centerline of road, approximately 0.78 mile from intersection with gravel road, 0.47 mile east of intersection with State Route 146, approximately 1.3 miles north along State Route 146 from intersection with Atchison, Topeka and Santa Fe Railway at Rye.
RM 11	25	118.94	Square head bolt set in southwest corner of concrete slab, 300 feet north of bridge over Menard Creek, approximately 0.76 mile north along paved road from railroad crossing at Fuqua.
RM 12	25	104.24	Metal rod, 2 inches above bridge floor on northeast abutment of access road bridge over Menard Creek, approximately 0.75 mile north along paved road from railroad crossing at Fuqua.
RM 13	25	116.60	Square head bolt set in concrete, protruding 0.5 foot above ground, 150 feet north of centerline of main track and 20 feet west of centerline of paved road at railroad crossing at Fuqua.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 14	25	119.06	Railroad spike in base of pine tree, 40 feet west of pipeline crossing, 20 feet north of centerline of gravel road, 0.78 mile northeast of Y-intersection, 150 feet north of railroad crossing at Fuqua.
RM 15	25	122.67	Railroad spike in post, 20 feet north of centerline of gravel road, 1.5 miles northeast of Y-intersection, 150 feet north of railroad crossing at Fuqua.
RM 16	25	132.21	Standard disk, stamped F 309 1935, set in top of concrete post, at edge of pine forest, 34 feet south of centerline of Atchison, Topeka, and Santa Fe Railway track, 189 feet southeast of milepost 119, 1.4 miles east along railroad from station at Fuqua.
RM 17	50	157.34	Spike in power pole, 800 feet east of FM 1725 along trailer park access road.
RM 18	50	157.57	Spike in power pole in west right of way of FM 1725, at curve where Low Water Bridge Road intersects FM 1725.
RM 19	50	146.15	Spike in power pole in south right of way of FM 1725, 1,300 feet east of Whiskey Branch, 2,800 feet south of Low Water Bridge Road.
RM 20	50	151.61	Spike in power pole in north right of way of FM 1725, 1,600 feet north of Whiskey Branch, 1,100 feet west of curve in road.
RM 21	50	142.21	Spike in power pole in north right of way of FM 1725, at curve 0.9 mile northwest of State Route 105.
RM 22	50	140.91	Spike in railroad sign on south side of Atchison, Topeka, and Santa Fe Railway, 4,600 feet west of FM 1725, 500 feet north of State Route 105.
RM 23	50	132.12	Railroad spike in power pole in north right of way of State Route 105, 3,750 feet west of intersection of FM 1725 and State Route 105.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 24	50	146.93	Spike in transmission pole 350 feet east of oil road, 1,500 feet south of State Route 105.
RM 25	50	144.11	Spike in 20-inch diameter sweetgum tree on east side of oil road, 3,300 feet south of State Route 105.
RM 26	50	135.31	Railroad spike in 8-inch diameter pine tree on east side of oil road, 5,000 feet south of State Route 105.
RM 27	50	176.13	Railroad spike in power pole in east right of way of FM 2025, at crossing of transmission line and pipeline.
RM 28	50	153.15	Spike in power pole in south right of way of Low Water Bridge Road, 1,100 feet west of Cold Springs Road.
RM 29	50	136.50	Spike in power pole in south right of way of Low Water Bridge Road, 0.5 mile east of FM 1725.
RM 30	50	133.99	Chiseled X in northeast hedwall of State Route 105 bridge over East Fork San Jacinto River.
RM 31	50	130.95	Railroad spike in 16-inch diameter pine tree in south right of way of State Route 105 at FM 1725 intersection with State Route 105.
RM 32	50	130.33	Spike in power pole between U.S. Route 59 and Southern Pacific Railroad, just west of small lake and 3,200 feet southwest of Cleveland City limits.
RM 33	50	120.79	Railroad spike in power pole on north side of Gladstell Road at Southern Pacific Railroad crossing; 150 feet east of U.S. Route 59.
RM 34	50	128.72	Railroad spike in power pole on south side of dirt lane, 800 feet east of south end of oil road, approximately 1,800 feet west of the East Fork San Jacinto River.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 35	50	118.72	Railroad spike in power pole on west side of U.S. Route 59, 900 feet southwest of bridge over the East Fork San Jacinto River.
RM 36	50	113.10	Spike in 14-inch diameter chestnut tree on north side of Gladstell Road, 3,500 feet west of FM 1010.
RM 37	50	140.38	Railroad spike in power pole on east side of FM 1010 at Gladstell Road intersection.
RM 38	50	166.09	USC&GS disk stamped L 980 in top of concrete post near ground level, between U.S. Route 59 and Atchison, Topeka and Santa Fe Railway, south of drive-in theater.
RM 39	50	167.23	Railroad spike in power pole, west of U.S. Route 59, 1,500 feet north of power transmission line crossing, 700 feet east of church.
RM 40	50	165.16	Railroad spike in power pole at OK truck stop, northwest of intersection of U.S. Route 59 and power transmission line.
RM 41	50	157.83	Railroad spike in power pole at northwest corner of intersection of two dirt roads, 1,300 feet southwest of power transmission line crossing dirt road.
RM 42	50	151.85	Railroad spike in power pole in north right of way of FM 787, 1,400 feet west of FM 787 bridge over Reese Bayou.
RM 43	75	149.17	Railroad spike in 7-inch diameter pine tree, back of hole No. 5 in golf course, 100 feet east of transmission line, on northwest corner of curve of logging road; 800 feet southwest of Reese Bayou.
RM 44	75	146.45	Railroad spike in 18-inch diameter water oak tree in northeast right of way of State Routes 321/105, 2,000 feet southeast of high school.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 45	75	158.44	Railroad spike in power transmission pole No. 16-187, 1,500 feet west of Atchison, Topeka and Santa Fe Railway along transmission line.
RM 46	75	159.50	Railroad spike in power pole at northwest corner of intersection of Atchison, Topeka and Santa Fe Railway and county landfill road.
RM 47	75	154.48	USC&GS disk stamped V166, in top of concrete post in the north right of way of Atchison, Topeka and Santa Fe Railway, 3,200 feet northeast of Tarkington Bayou.
RM 48	75	155.26	Railroad spike in power pole in south right of way of FM 787, 200 feet east of county road, 2,500 feet west of pipeline.
RM 49	75	153.77	Railroad spike in power pole in south right of way of FM 787, west of D.C. Howard Road.
RM 50	75	135.95	Railroad spike in 12-inch diameter pine tree in south right of way of State Routes 321/105 at paved road from south, approximately 3,500 feet northwest of State Route 105 bridge over Tarkington Bayou.
RM 51	75	136.1	Railroad spike in power pole in south right of way of State Routes 321/105, 1,250 feet east of Oakdale Street.
RM 52	75	134.59	Railroad spike in power pole on south side of Timberlane Drive at entrance to landing strip, 4,200 feet west of pipeline.
RM 53	75	132.68	Railroad spike in transmission pole on north-south pipeline, 3,400 feet south of State Routes 321/105, approximately 1,100 feet southeast of landing strip.
RM 54	75	122.86	Railroad spike in power pole on east side of pipeline, 250 feet south of logging road crossing pipeline; 2,200 feet west of Marsh Branch.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 55	75	122.96	Spike in power pole on east side of pipeline, 3,400 feet north of power transmission line, 950 feet west of Marsh Branch.
RM 56	75	158.69	Railroad spike in 10-inch diameter pine tree on west side of Pelican Road, 2,200 feet south of T road to east, 1.1 miles north of Atchison, Topeka and Santa Fe Railway.
RM 57	75	167.25	Railroad spike in 18-inch diameter pine tree on west side of logging road, northwest of curve, 4,300 feet southeast of pipeline crossing.
RM 58	75	156.74	Railroad spike in transmission pole in north right of way of Atchison, Topeka and Santa Fe Railway, 3,200 feet northeast of transmission line crossing.
RM 59	75	153.17	Railroad spike in transmission pole in north right of way of Atchison, Topeka and Santa Fe Railway and 200 feet west of Pelican Road, 500 feet south of Marsh Branch.
RM 60	75	153.60	Spike in power pole in north right of way of FM 787, east of Pelican Road, 2,400 feet northeast of Cleveland Airport entrance.
RM 61	75	154.85	Chiseled X in southeast corner of telephone J-box platform in north right of way of FM 787, 4,100 feet northeast of Cleveland Airport entrance.
RM 62	75	153.34	Railroad spike in 8-inch diameter sweetgum tree on west side of road, 100 feet south of transmission line and 4,000 feet east of Cleveland Airport.
RM 63	75	151.64	Railroad spike in power pole, 1,750 feet east of intersection of FM 787 and Pelican Road.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 64	75	151.52	Railroad spike in power pole in south right of way of FM 787, 100 feet southwest of Cleveland Airport entrance.
RM 65	75	143.44	Railroad spike in 8-inch diameter pine tree, 600 feet southeast of south end of Cleveland Airport runway, on west side of road parallel to runway.
RM 66	75	160.73	Railroad spike in 30-inch pine tree on south side of dirt road, between two rice fields, 1.1 miles north of Atchison, Topeka and Santa Fe Railway, 2,700 feet west of Marsh Branch Tributary No. 1.
RM 67	75	156.72	Railroad spike in power pole at west side of 90 degree curve in dirt road, 2,600 feet northwest of railroad.
RM 68	75	156.75	Railroad spike in power pole north of curve in dirt road, 1,200 feet northwest of Atchison, Topeka and Santa Fe Railway.
RM 69	75	164.05	Railroad spike in transmission pole between dirt road and Atchison, Topeka and Santa Fe Railway, 2,250 feet northeast of intersection of FM 2518 and Atchison, Topeka and Santa Fe Railway.
RM 70	100	82.42	Chiseled square on top of southwest concrete guardrail at FM 787 bridge over the Trinity River.
RM 71	100	82.18	Chiseled square in top of downstream guardrail at east end of FM 787 bridge over Nevill Bayou, approximately 2,000 feet west of the Trinity River main channel.
RM 72	125	116.53	60^{d} nail in power pole No. 19052 south of Driftwood Drive, approximately 0.27 mile west of 90 degree curve in Driftwood Drive.
RM 73	125	117.06	60^{d} nail in power pole No. 19055 south of Driftwood Drive,approximately 500 feet west of 90 degree curve in Driftwood Drive.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 74	125	113.83	60^{d} nail in power pole No. 19067, on East May Drive, just north of intersection of Applewood Drive.
RM 75	125	133.81	Railroad spike in 16-inch diameter pine tree on east side of FM 1010, 1.2 miles south of Gladstell Road intersection, 2,000 feet south of pipeline.
RM 76	125	128.84	Railroad spike in 12-inch diameter pine tree on west side of FM 1010, 2.6 miles south of Gladstell Road intersection, 350 feet south of dirt road.
RM 77	125	111.68	Railroad spike in power pole on east side of FM 1010 approximately 1.3 miles north of Plum Grove city limit sign.
RM 78	125	102.46	Railroad spike in 12-inch diameter sweetgum tree on east side of FM 1010 approximately 0.6 mile north of Plum Grove city limit sign.
RM 79	125	83.13	Railrod spike in 12-inch diameter red oak tree in south right of way of pipeline and 1,700 feet west of junction with north-south pipeline, 1,800 feet northwest of Luce Bayou.
RM 80	125	81.58	Railroad spike in power pole in southeast quadrant of junction of two pipelines, 800 feet northwest of Luce Bayou.
RM 81	150	119.24	Railroad spike in power pole in southeast quadrant of intersection of pipeline and power transmission line.
RM 82	150	118.26	Railroad spike in power pole on east side of pipeline, 2,100 feet south of intersection of pipeline and Gulf Road.
RM 83	150	130.62	Railroad spike in power pole on east side of pipeline, 1,150 feet north of logging road crossing pipeline, 900 feet west of Allan Pond.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 84	150	131.11	Railroad spike in power pole on east side of pipeline, 400 feet south of logging road crossing pipeline, 3,000 feet east of Tarkington Bayou.
RM 85	150	129.43	Railroad spike in power pole on east side of pipeline, 1,300 feet north of Tarkington Bayou along pipeline.
RM 86	150	123.00	Railroad spike in 6-inch diameter pine tree on north side of logging road, 2,000 feet west of junction of two logging roads, 1,700 feet east of Tarkington Bayou.
RM 87	150	116.63	Railroad spike in 10-inch diameter pine tree on east side of logging road, 2,400 feet north of pipeline crossing, 700 feet northwest of John Garner Pond.
RM 88	150	118.62	Railroad spike in 14-inch diameter red oak tree in northwest quadrant of logging road and gas pipeline crossing, 1,500 feet south of John Garner Pond.
RM 89	150	112.33	Railroad spike in 4-inch diameter pine tree on west side of logging road, 2,900 feet south of pipeline.
RM 90	150	96.04	Railroad spike in 20-inch water oak tree on west side of logging road at intersection with old road bed from west, 1,100 feet north of intersection of three logging roads.
RM 91	150	110.16	Railroad spike in 6-inch diameter pine tree on west side of logging road, 2,300 feet southeast of intersection of three logging roads.
RM 92	150	110.26	Railroad spike in 8-inch pine tree east of logging road, 2,050 feet north of logging road to the east, 3,400 feet west of Rice Road.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 93	150	87.69	Railroad spike in 30-inch diameter water oak tree on east side of logging road, just north of Tarkington Bayou and 900 feet northeast of junction of two logging roads.
RM 94	150	102.49	Railroad spike in 16-inch pine tree on east side of logging road, 700 feet southeast of junction of two logging roads, 1,500 feet west of Tarkington Bayou.
RM 95	150	118.92	Chiseled X in THD FAP MONUMENT at intersection of State Route 321 and FM 1008.
RM 96	150	111.52	Railroad spike in power pole in north right of way of FM 1008 at intersection of dirt road to the south, 1.3 miles east of State Route 321.
RM 97	150	112.55	Railroad spike in guy wire pole in west right of way of State Route 321; 0.8 mile south of intersection of State Route 321 and FM 1008.
RM 98	150	105.59	Railroad spike in power pole located in east right of way of State Route 321 at logging road crossing.
RM 99	150	100.90	Railroad spike in 8-inch diameter pine tree at junction of two logging roads, 1.3 miles east of State Route 321, 1,200 feet southwest of pipeline.
RM 100	150	107.93	Railroad spike n power pole in east right of way of State Route 321 at logging road entrance, 1,900 feet northwest of private drive.
RM 101	150	100.42	Spike in 16-inch diameter water oak tree east of logging road, 400 feet south of junction of two logging roads, approximately 1.0 mile east of State Route 321.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 102	150	99.46	Railroad spike in power pole in east right of way of State Route 321 at logging road entrance, 500 feet southeast of private driveway.
RM 103	150	95.72	Railroad spike in power pole in east right of way of State Route 321 at logging road entrance, approximately 3,500 feet north of Luce Bayou bridge.
RM 104	150	95.42	Railroad spike in transmission pole 200 feet north of logging road crossing, 2,600 feet west of State Route 321.
RM 105	150	94.57	Railroad spike in transmission pole approximately 1,500 feet south of Luce Bayou approximately 2,500 feet west of the Bayou bridge on Highway 321.
RM 106	150	97.82	Railroad spike in power pole in east right of way of State Route 321 approximately 4,000 feet south of State Route 321 bridge over Luce Bayou.
RM 107	150	96.24	Railroad spike in 14-inch diameter pine tree east of logging road and 350 feet south of junction of two logging roads, 1,400 feet west of mouth of Tarkington Bayou.
RM 108	175	40.13	Standard tablet stamped 56 RDS 1954, set in top of concrete post, 70 feet northwest of valves in pipeline, 60 feet north of center of pipeline row, 440 feet west of west bank of Trinity River at pipeline crossing.
RM 109	200	89.48	Spike in 24-inch red oak tree located at most northwest corner of levee surrounding reservoir, 50 feet south of road.
RM 110	200	87.71	Railroad spike in 5-inch elm tree located on north side of logging road, 450 feet north of natural gas pipeline, 2,400 feet west of large reservoir.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 111	200	84.79	Railroad spike in 6-inch red oak tree on south side of logging road, 3,200 feet northeast of junction of two logging roads, 1,500 feet north of rice field.
RM 112	200	79.92	Railroad spike in 10-inch pine tree on north side of logging road, 500 feet southeast of Luce Bayou and 2,500 feet west of rice field.
RM 113	200	82.00	Railroad spike in 16-inch water oak tree in north right of way of pipeline at Champion Fence crossing on Luce Bayou, 3,500 feet east of north-south pipeline.
RM 114	200	80.35	3.8-inch lag bolt driven horizontally into wooden bridge support beam, 0.5 foot below road surface at center of east (upstream) end of bridge over Cedar Bayou. Bridge is at upstream access road crossing.
RM 115	200	78.23	Nail set horizontally in support beam at left upstream end of wooden bridge over Cedar Bayou. Bridge is located approximately 1.5 miles downstream of upstream access road crossing.
RM 116	200	80.50	Chiseled square in top of west end of concrete culvert under FM 686 at intersection of downstream access road crossing Cedar Bayou and FM 686.
RM 117	200	76.71	3/8-inch lag bolt 3.0 feet above ground in first pole east of Cedar Bayou, approximately 3,500 feet upstream from low-water crossing, and approximately 4,200 feet west of FM 686.
RM 118	200	63.80	Chiseled square in top center of upstream (north) end of low-water crossing over Cedar Bayou, approximately 1.5 miles upstream of FM 1960, and approximately 1.8 miles west of community of Eastgate.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 119	200	68.97	Spike in end of 1 foot square wood pier cap near upstream west end of bridge on Huffman Road over Cedar Bayou, approximately 1,100 feet upstream of FM 1960.
RM 120	200	74.78	Standard disk stamped Y 1248 1978 set in top of east end of north headwall of west triple box culvert at northeast corner of intersection of FM 1960 and paved road, approximately .57 mile east of FM 1960 and Missouri Pacific Railroad.
RM 121	200	72.68	Railroad spike in left downstream abutment on bridge of road leading east, across from Eastgate Church, 1,340 feet south of intersection with FM 1960.
RM 122	200	64.90	Approximately .57 miles east of FM 1960 and Missouri Pacific Railroad intersection to paved road crossing FM 1960, then 1.2 miles south along said paved road to first intersection with access road, then west 1,750 feet along access road to bridge over westmost twin ditch; railroad spike in upstream side of 1 foot by 1 foot wooden center support of first bridge.
RM 123	200	69.77	Railroad spike on top of 1.0 foot diameter pole supporting downstream left abutment wing wall on paved access road crossing western twin ditch, approximately 1.2 miles west of intersection with another paved access road, approximately 1.2 miles south of FM 1960.
RM 124	200	64.68	Railroad spike in downstream end of 1 foot by 1 foot wooden support of right abutment of bridge crossing western twin ditch at second intersection of paved road 2.1 miles south of intersection FM 1960 and said paved road; approximately .57 mile east of FM 1960 and Missouri Pacific Railroad intersection.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 125	200	86.62	Railroad spike in power pole on northeast corner of intersection, 5,000 feet east of East-West Dayton Ditch, 1.44 miles north of intersection with FM 1960.
RM 126	200	86.42	Railroad spike in power pole beside metal barn on west side of road, 2,650 feet east of East-West Dayton Ditch, 4,400 feet north of intersection with FM 1960.
RM 127	200	84.78	Railroad spike in power pole on southwest corner of radio tower entrance, 2,600 feet east of East-West Dayton Ditch, 2,500 feet north of intersection with FM 1960.
RM 128	200	79.16	Standard USC&GS disk stamped BM U-1248 set in top of east end of upstream culvert headwall over drainage ditch, 3.08 miles west of FM 1960 and State Route 321 intersection.
RM 129	200	45.00	Chiseled square at flow line in upstream lip of center box of 3-box concrete culverts under FM 1008, 200 feet north of Missouri Pacific Railroad crossing.
RM 130	200	78.14	Standard tablet stamped 43 RDS 78 1954 in concrete post 1.0 foot west of fence line, 12.0 feet north of power pole, approximately .88 mile south of Missouri Pacific Railroad and FM 1008 intersection.
RM 131	225	42.50	Texas Highway Department reference mark at flow line at downstream end of 18-inch circular concrete pipe under FM 1011, 2.6 miles north of intersection of FM 1011 and State Route 146.
RM 132	250	57.38	USC&GS BM R 1200 1972 standard disk set in top of wing wall at northeast corner of 65 foot concrete highway bridge over swamp, located approximately 2.05 miles east along U.S. Route 90 from Devers School, 23.5 feet north of centerline of highway, and 3.5 feet west of east end of wing wall.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 133	250	52.00	Chiseled X on top of steel girder near center of upstream side of bridge over Willow Creek located on gravel road 0.9 mile north of intersection of U.S. Route 90 and said gravel road; intersection is 1.7 miles east of State Route 61 and U.S. Route 90 intersection.
RM 134	250	51.87	Railroad spike set in root of tree on east side of fence, approximately 100 feet east of crest of levee, and approximately 400 feet north of north-south trail at southwest corner of Rays Pond.
RM 135	250	52.12	Railroad spike in tree trunk, 1,350 feet along south side of levee to trail running north-south at southwest corner of levee of Rays Pond, then 2,050 feet north along said trail to fence corner.
RM 136	250	49.14	Nail in 10-inch tree, 10.0 feet east of centerline of K Road, located 1.2 miles north of east-west bend in road, approximately 2.0 miles north of U.S. Route 90.
RM 137	250	47.79	Railroad nail 3 inches above ground, 50 feet north of Square Road and 30 feet west of Deer Camp Road.
RM 138	250	49.37	Nail in pine tree, 9 inches above ground, 60 feet north of Square Road and 40 feet west of Hogpen Road.
RM 139	250	44.68	Nail in a tree 6 inches above ground and below Kirby sign, 30 feet northeast of centerline of intersection of unnamed road running east-west and Square Road; said intersection is 1.6 miles north of metal gate on southern portion of Square Road.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 140	250	45.66	From intersection of State Route 61 at Devers, 4.18 miles east along U.S. Route 90 to gravel road leading north, thence 4,900 feet along gravel road to metal gate, thence east 3,800 feet along Square Road to metal gate, thence north along same road 1.46 mile to road leading east, thence 3,700 feet along road leading east to nail 3 feet above ground, in 2-foot diameter pine tree, 20 feet north of centerline of road and 20 feet southeast from the southeast corner of hunting cabin.
RM 141	250	52.24	From intersection of State Route 61 at Devers, 4.18 miles east along U.S. Route 90 to gravel road leading north, thence 4,900 feet along gravel road to metal gate; railroad spike in west post of gate.
RM 142	250	42.28	From intersection of State Route 61 at Devers, 4.18 miles east along U.S. Route 90 to gravel road leading north, thence 4,900 feet along gravel road to metal gate, thence east 3,800 feet along Square Road to metal gate; 1/4-inch bolt in west gate post.
RM 143	275	65.93	Railroad spike in 12-inch diameter hackberry tree, on east side of paved road adjacent to western Twin Ditch, 2.8 miles south of paved road and FM 1960 intersection; paved road 7.2 miles west of FM 1960 and State Route 321 intersection.
RM 144	275	53.93	Standard disk stamped Y-665 (1942) set in top of concrete post 0.5 foot above ground, 1.0 mile south of intersection of FM 1413 and Hatcherville Road, 0.2 mile north of irrigation ditch, 60.0 feet north of fence corner, 29.0 feet east of centerline of graded dirt road, 1.0 foot west of fence, and 1.1 foot south of witness post.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 145	275	54.28	Nail 2.0 feet above ground in first power pole north of transformer pole, 200 feet north of east end of east-west landing strip, and 1.6 miles south of intersection of FM 1413 and Hatcherville Road.
RM 146	275	41.21	Standard disk stamped U 1247 1978, 3.0 miles south along Hatcherville Road from intersection with FM 1413, 28.0 feet west of centerline of Hatcherville Road, 1.0 feet south of witness post.
RM 147	275	36.77	Standard disk stamped C 1019 1954 in top of concrete post, 37 feet northeast of centerline of Hatcherville Road at power line crossing, adjacent to Hickory Island Gully, 3,650 feet north of Frost Lake pumping station.
RM 148	300	40.12	USC&GS triangulation station WATTS, 1951, in top of concrete post 1 inch above ground, approximately 1.07 miles east along FM 770 from intersection of FM 563 and FM 770, and 91.0 feet south of centerline of FM 770.
RM 149	300	41.83	Chiseled square on top of east end of circular concrete culvert under FM 770, approximately 1,800 feet north of north turn in road 1.1 mile east of Shiloh.
RM 150	300	44.33	Nail in east side of east power pole, approximately 2.0 feet above ground, approximately 750 feet northwest of Turtle Bayou, and approximately 0.8 mile east of southward bend in FM 770.
RM 151	300	38.91	Nail in east side of east power pole, approximately 2.3 feet above ground, located approximately .60 mile west of Turtle Creek, approximately 1.7 miles east-northeast of Worthy Cemetery, along power line, 1.0 mile north of pipeline crossing, 1,800 feet north of east-west road, and on first pole north of bend in power line.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 152	300	39.86	USC&GS BM T 1018 disk in top of concrete post projecting 6 inches above ground, approximately 2.65 miles south of FM 563 and FM 770 intersection, 71 feet east of centerline of FM 563, 31 feet east of fence, and 1.5 feet south of fence.
RM 153	300	35.30	Nail in west side of west power pole, approximately 2.0 feet above ground, 250 feet north of unnamed road leading east from sulfur plant and radio tower, and 1.3 miles east of FM 563.
RM 154	300	36.55	USC&GS BM K 1018 disk in top of concrete post projecting 4 inches above ground, approximately 4.27 miles south along FM 563 from intersection of FM 563 and FM 770, 153.0 feet east of centerline of FM 563, 1.0 foot north of fence and 14.5 feet southeast of power pole.
RM 155	325	48.44	USC&GS BM Y 1200 1972, located approximately 4.63 miles east along U.S. Route 90 from Devers School, thence approximately 0.9 mile west of B. H. Willis Rice Drier at Felicia, 105 feet north of centerline of highway, 42.3 feet southwest of 7th telegraph pole west of the Southern Pacific Railroad mile post #304, 49 feet south of south rail of the Southern Pacific track, 16.5 feet east of highway right-of-way marker post, 2.4 feet west of power pole #77 and in line with line of poles to the east, 1.1 foot east of metal witness post, approximately 3 feet below level of highway, disk on top of 4-foot length of 5/8-inch copper coated steel rod projecting 0.2 foot and protected by 6-inch metal pipe which projects 0.5 foot.

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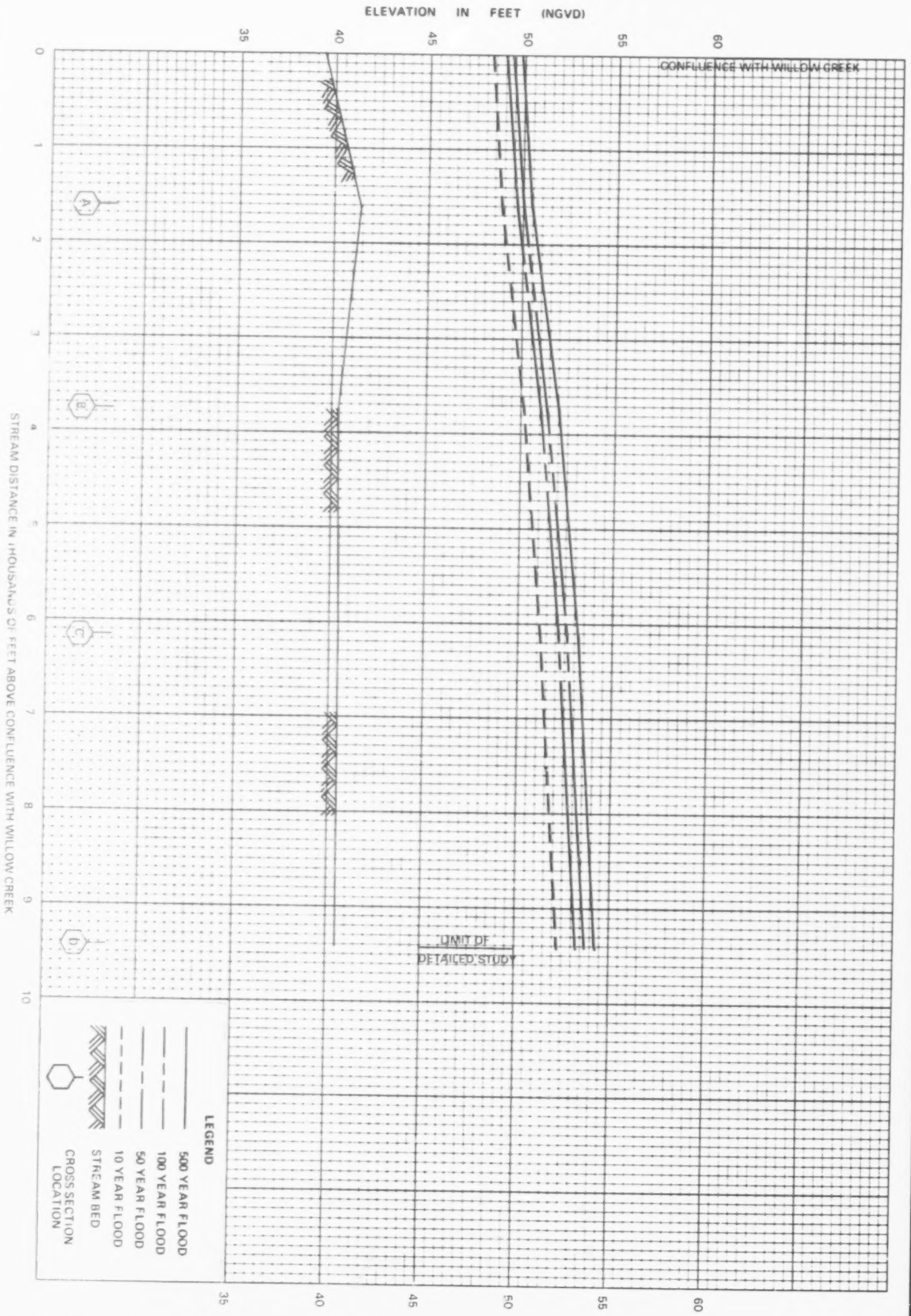


FEDERAL EMERGENCY MANAGEMENT AGENCY

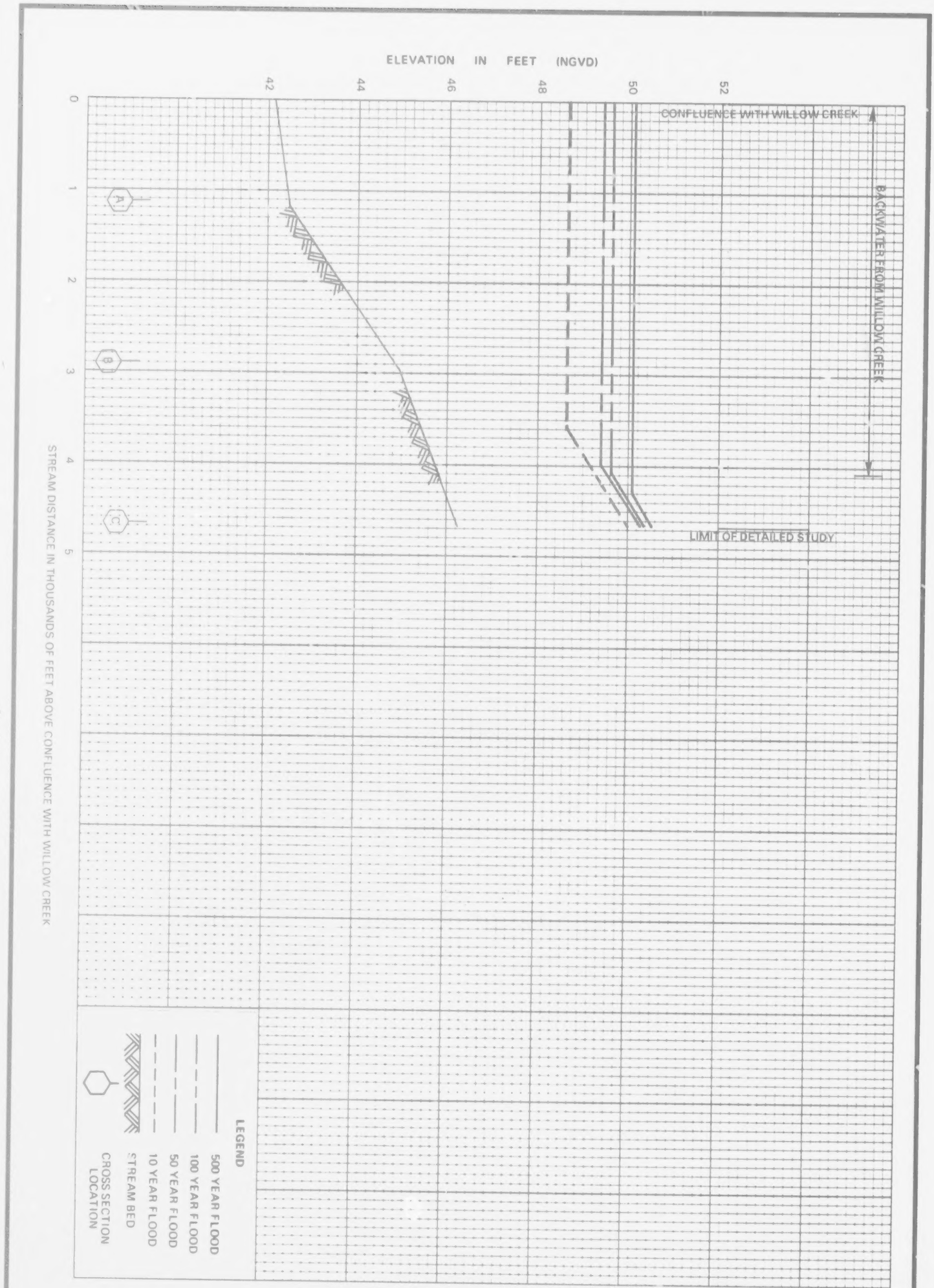
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

BATISTE CREEK

01P

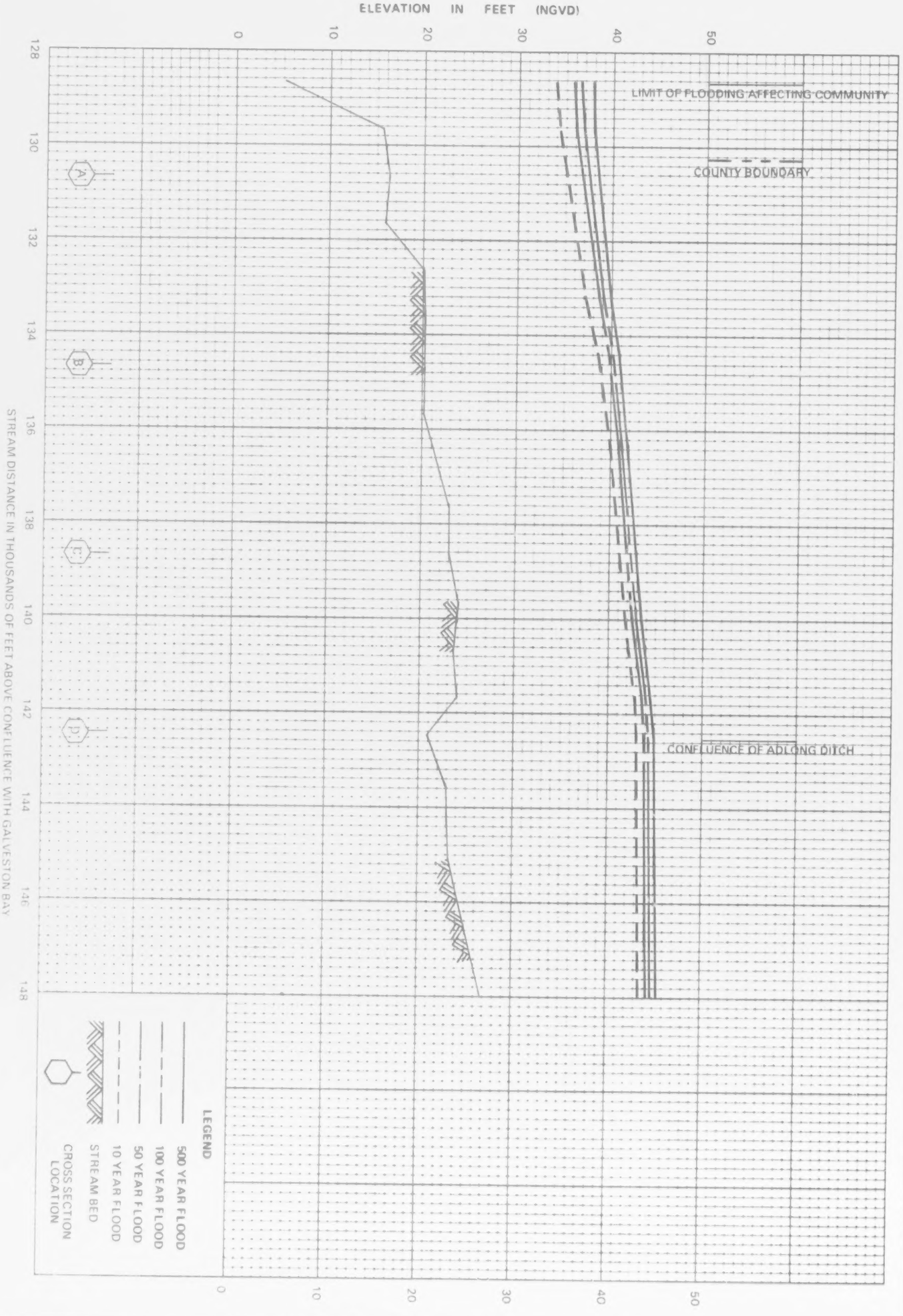
124488



E2

02P	FEDERAL EMERGENCY MANAGEMENT AGENCY LIBERTY COUNTY, TX (UNINCORPORATED AREAS)	FLOOD PROFILES BULL TOUNGE CREEK

124486



63

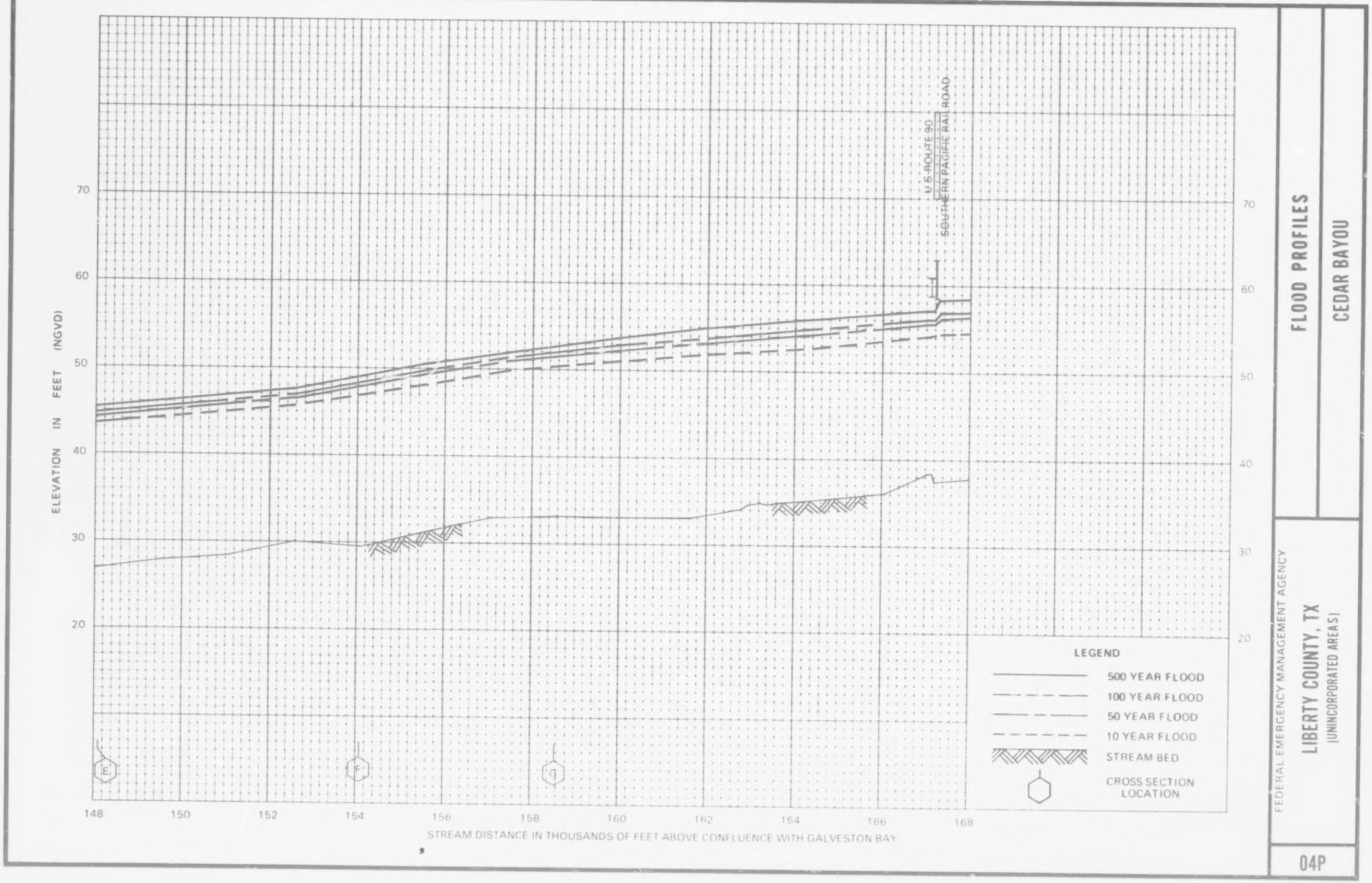
03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

CEDAR BAYOU



FLOOD PROFILES

CEDAR BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

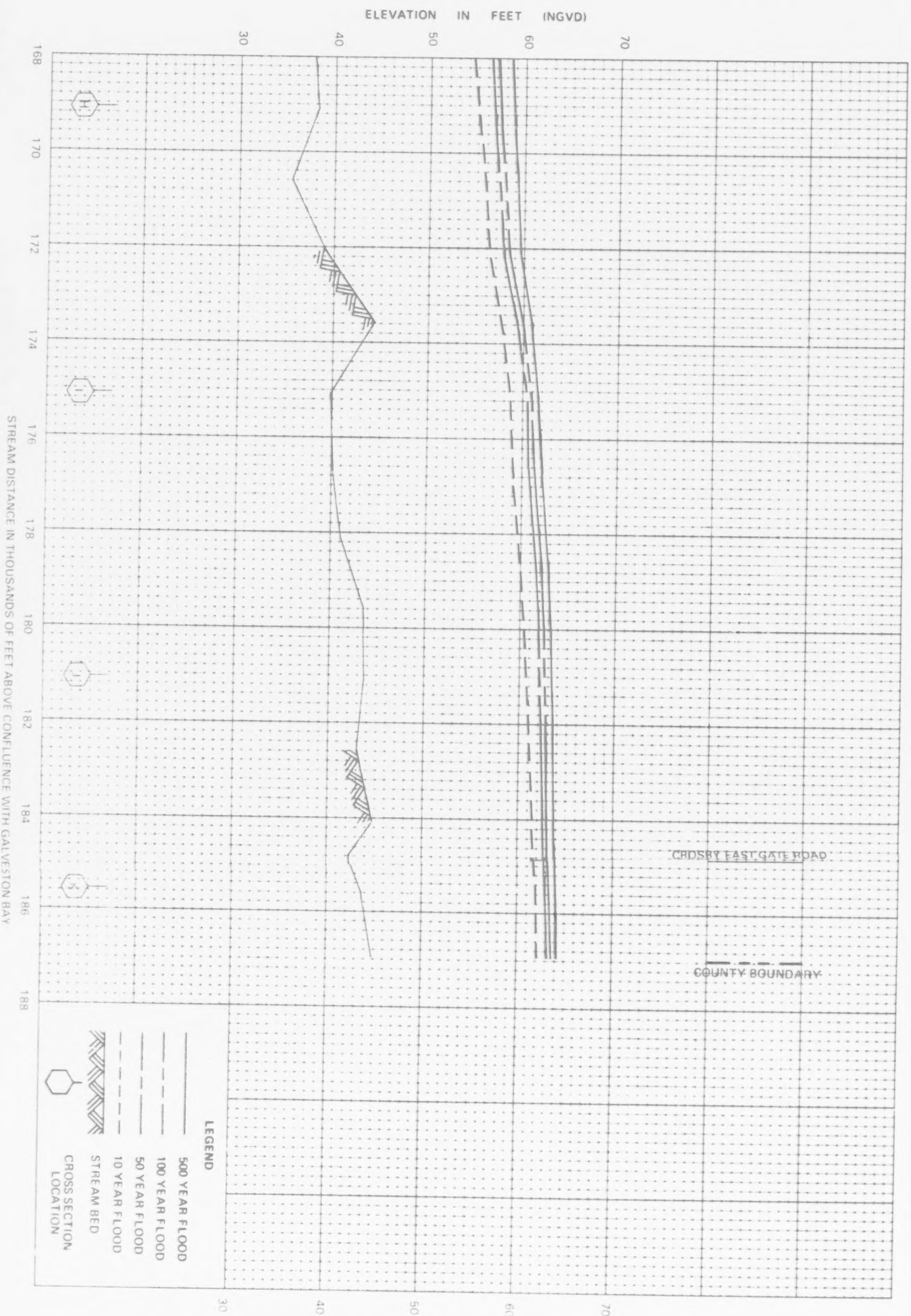
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

04P

124480

64

124488



FEDERAL EMERGENCY MANAGEMENT AGENCY

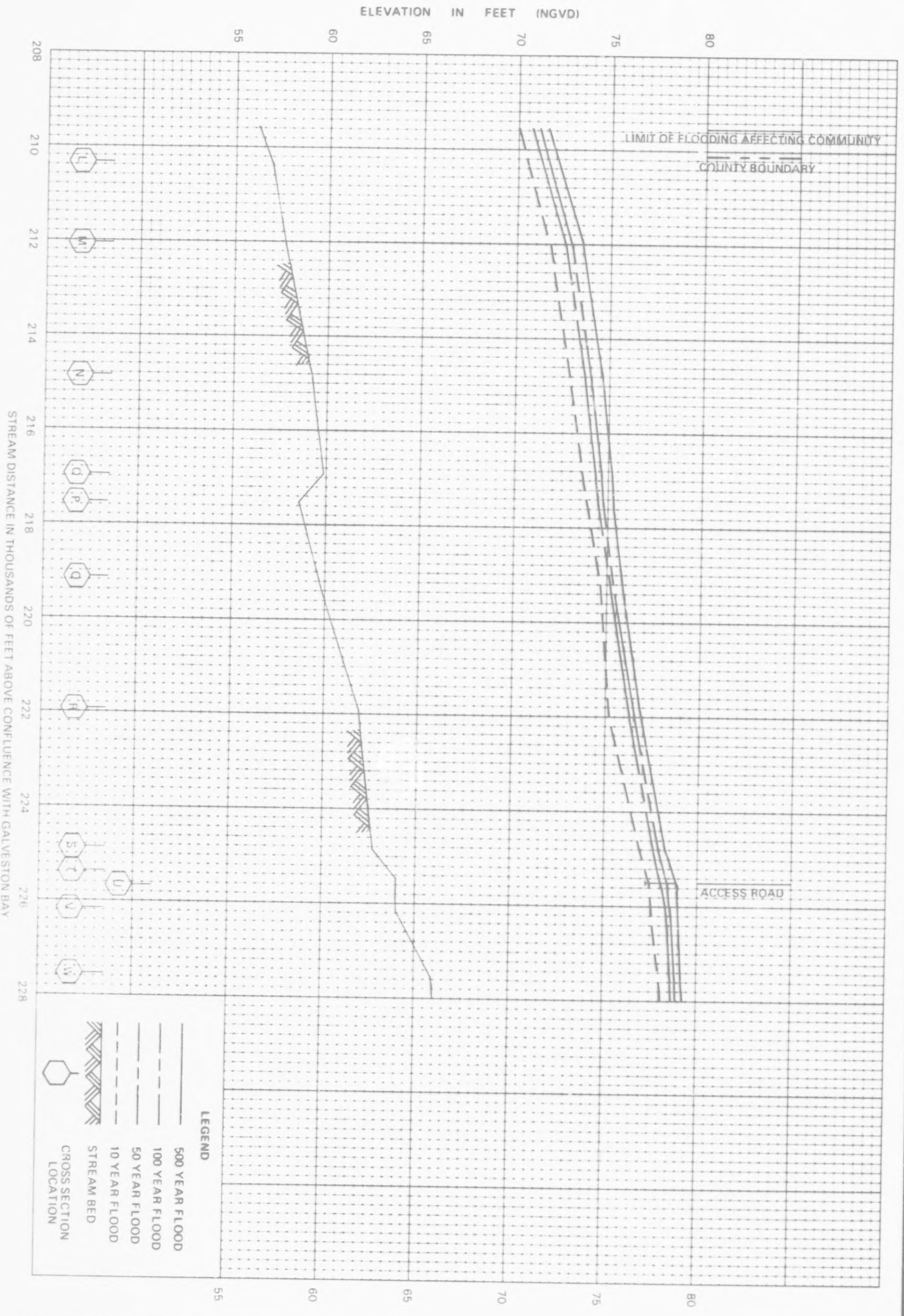
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

05P

FLOOD PROFILES

CEDAR BAYOU

124486



FEDERAL EMERGENCY MANAGEMENT AGENCY

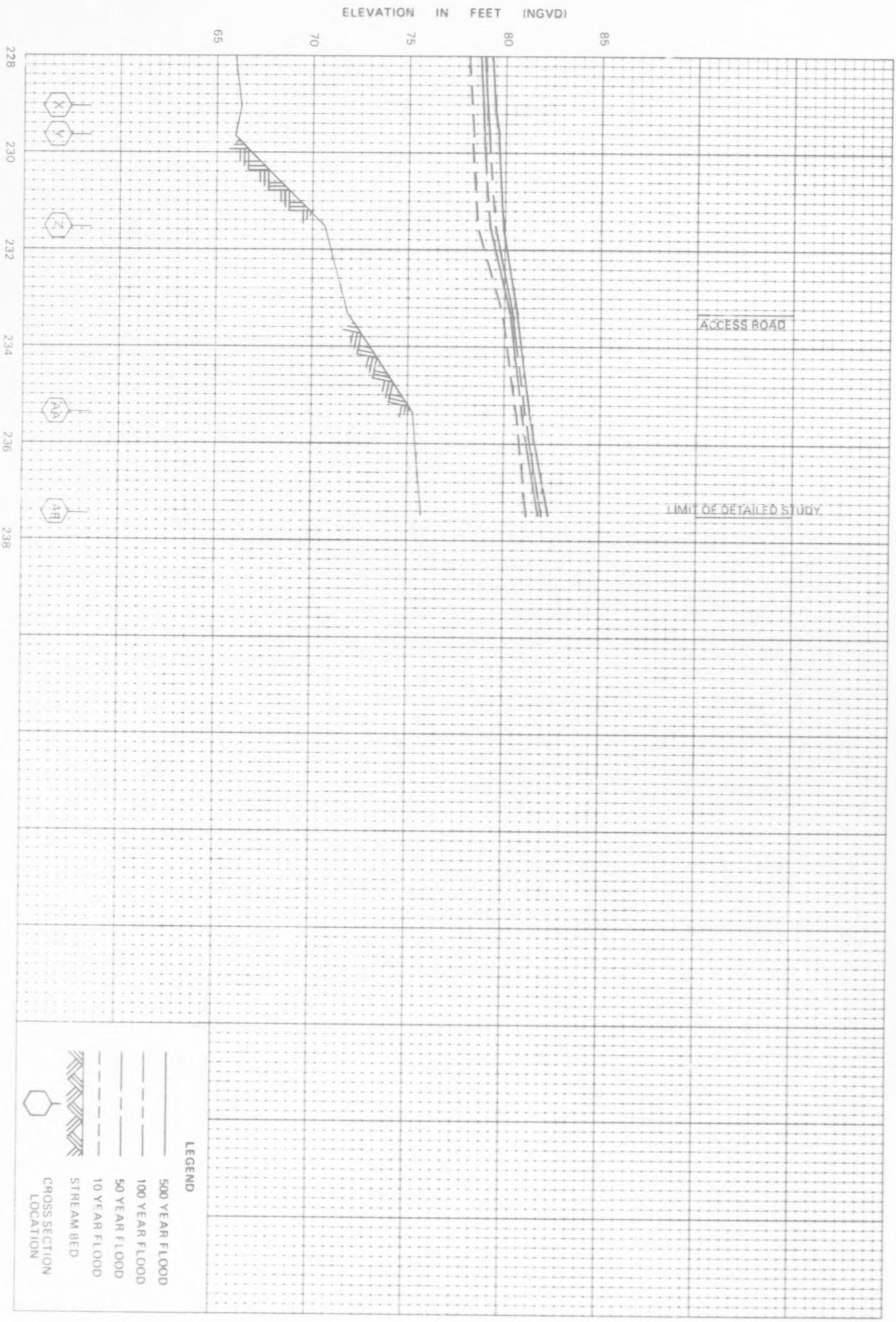
06P

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

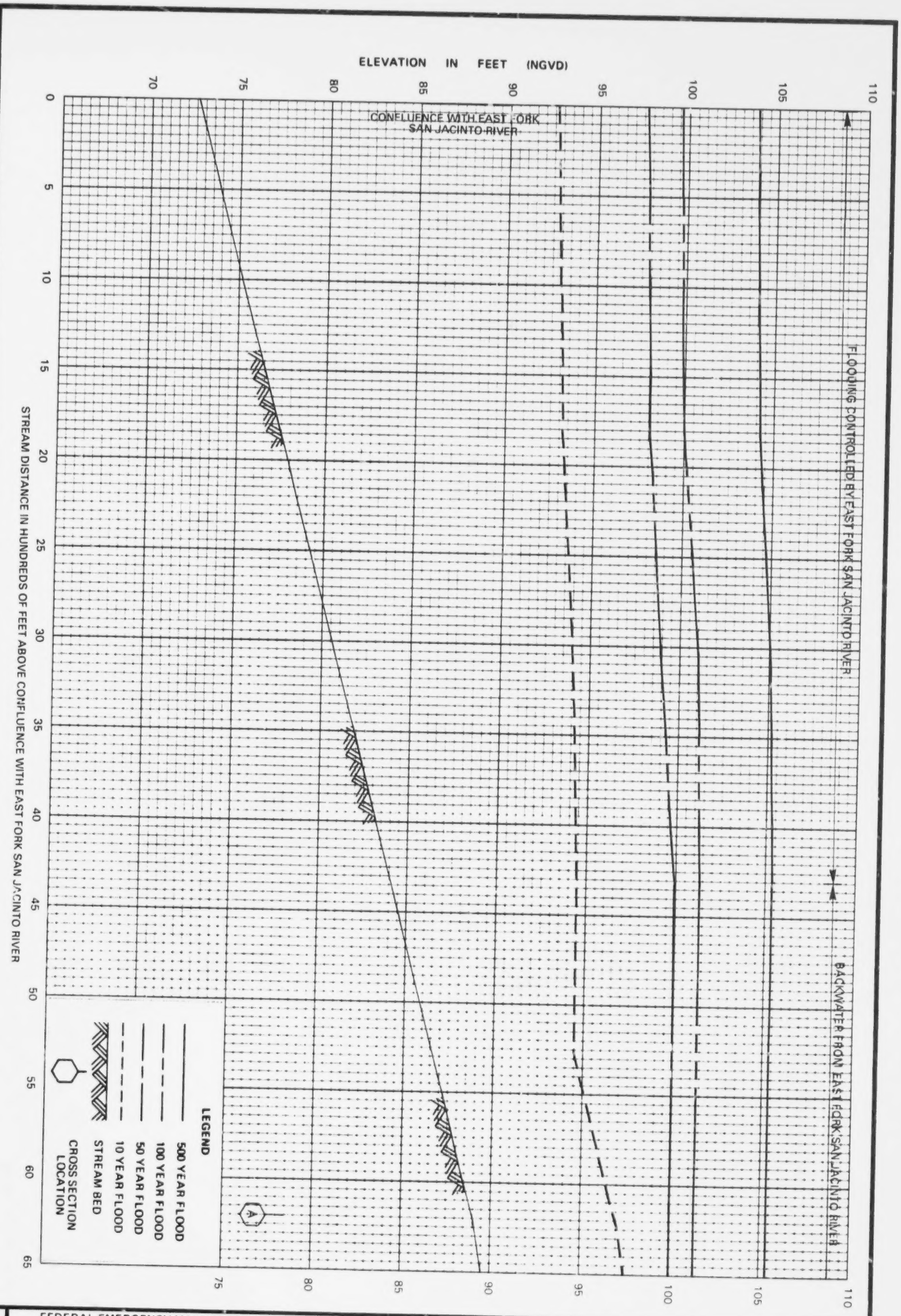
CEDAR BAYOU

124486



62

07P	FEDERAL EMERGENCY MANAGEMENT AGENCY LIBERTY COUNTY, TX (UNINCORPORATED AREAS)	FLOOD PROFILES CEDAR BAYOU



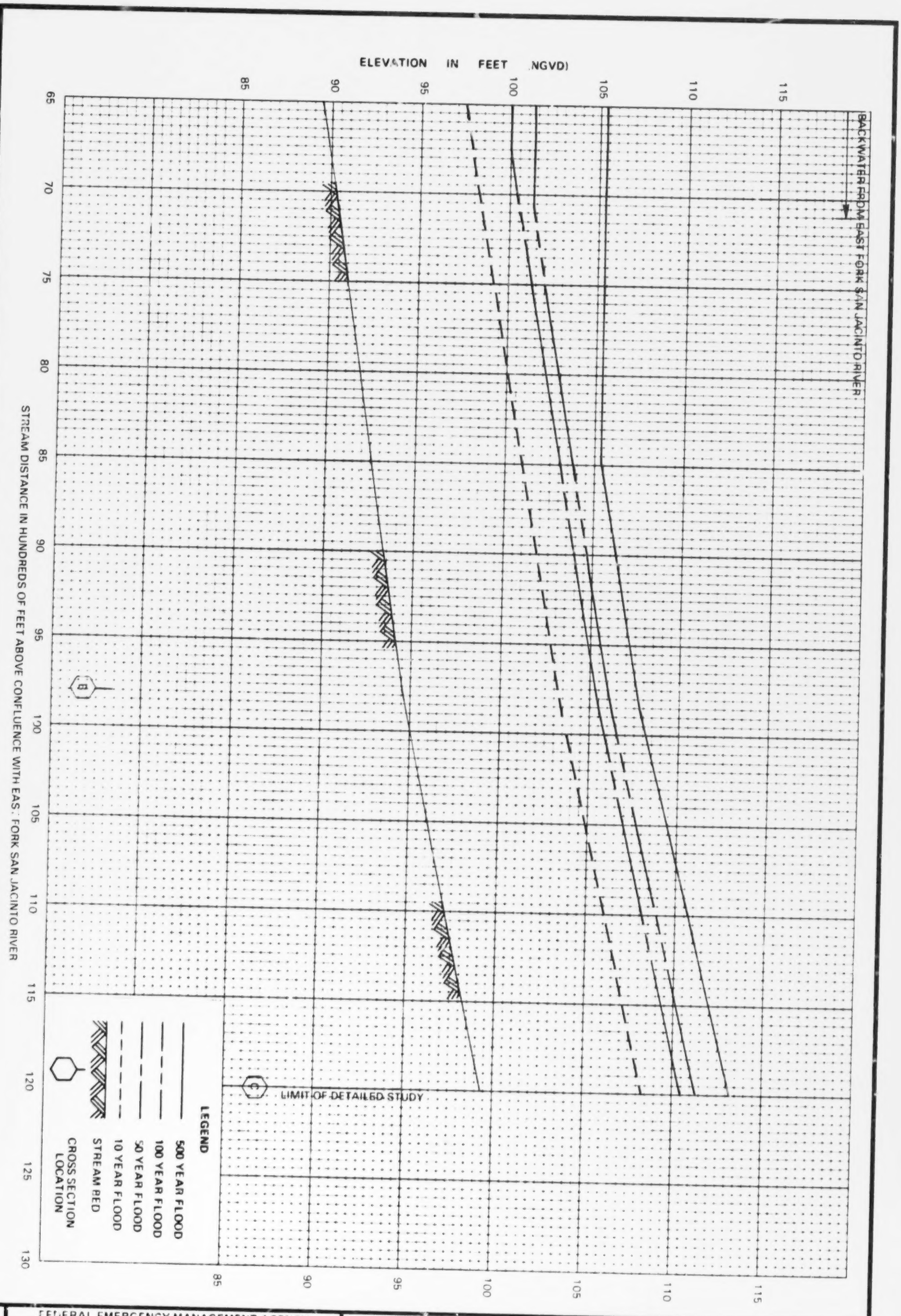
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

COW BRANCH

08P



69

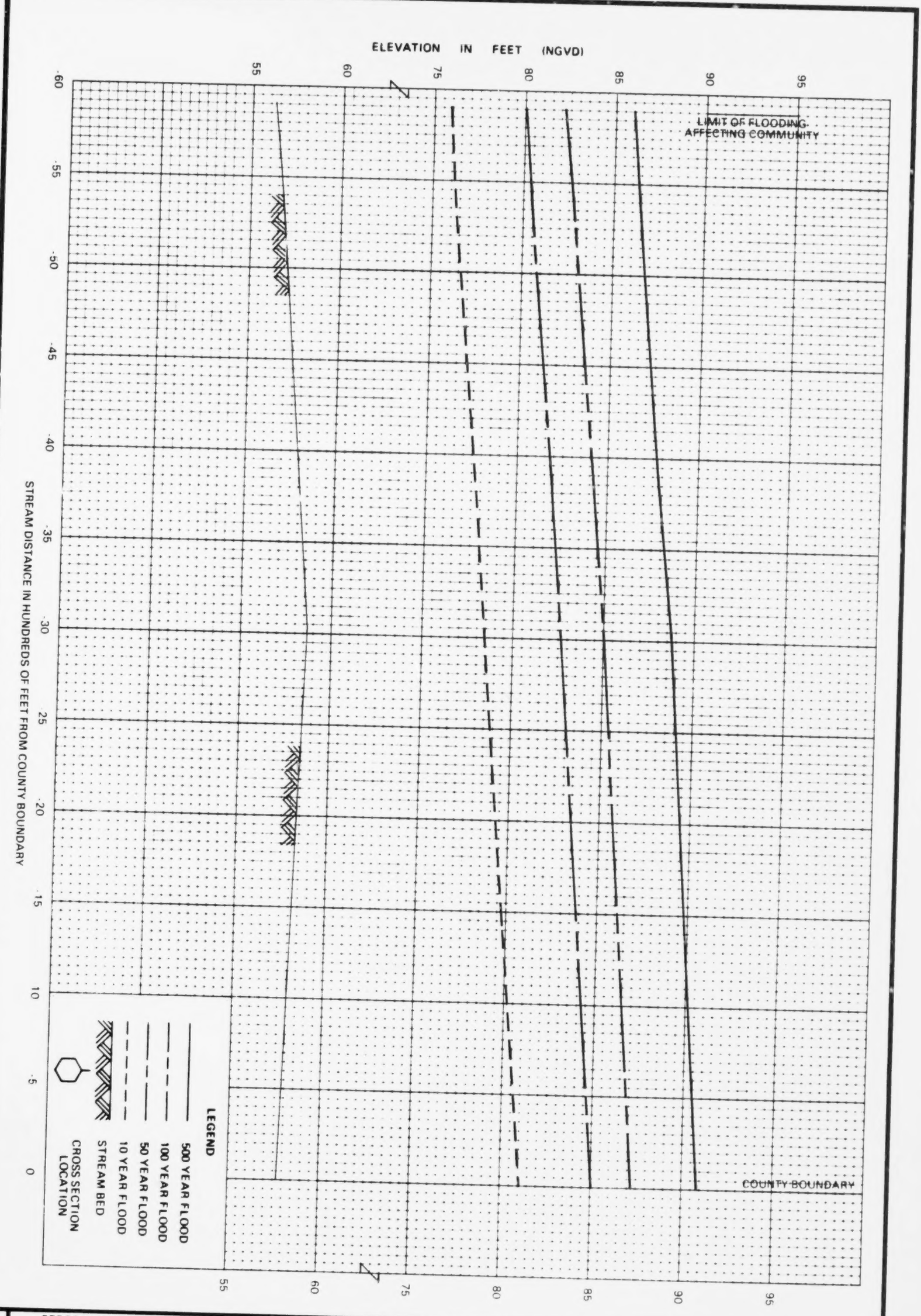
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

COW BRANCH

09P



FEDERAL EMERGENCY MANAGEMENT AGENCY

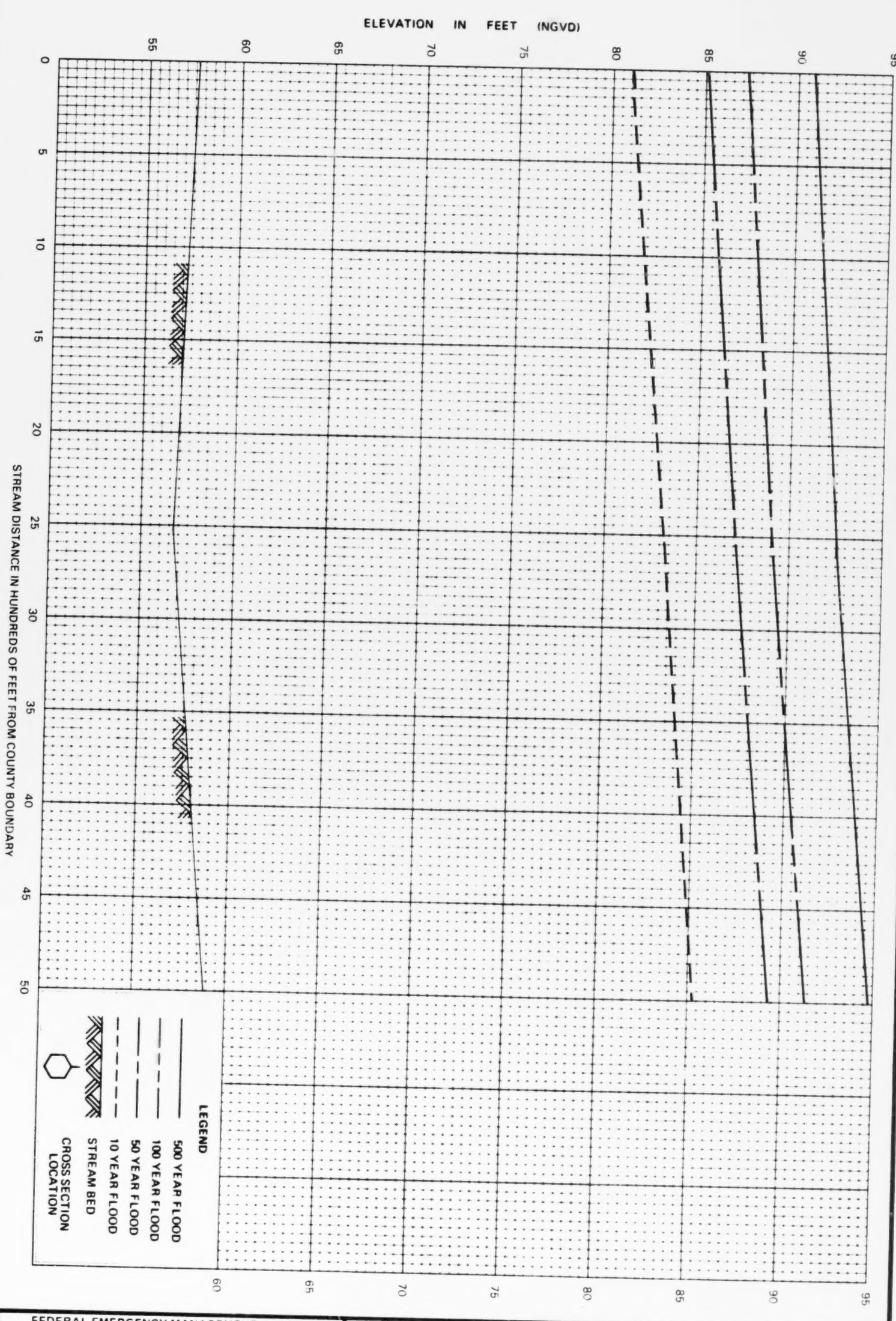
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

10P

70



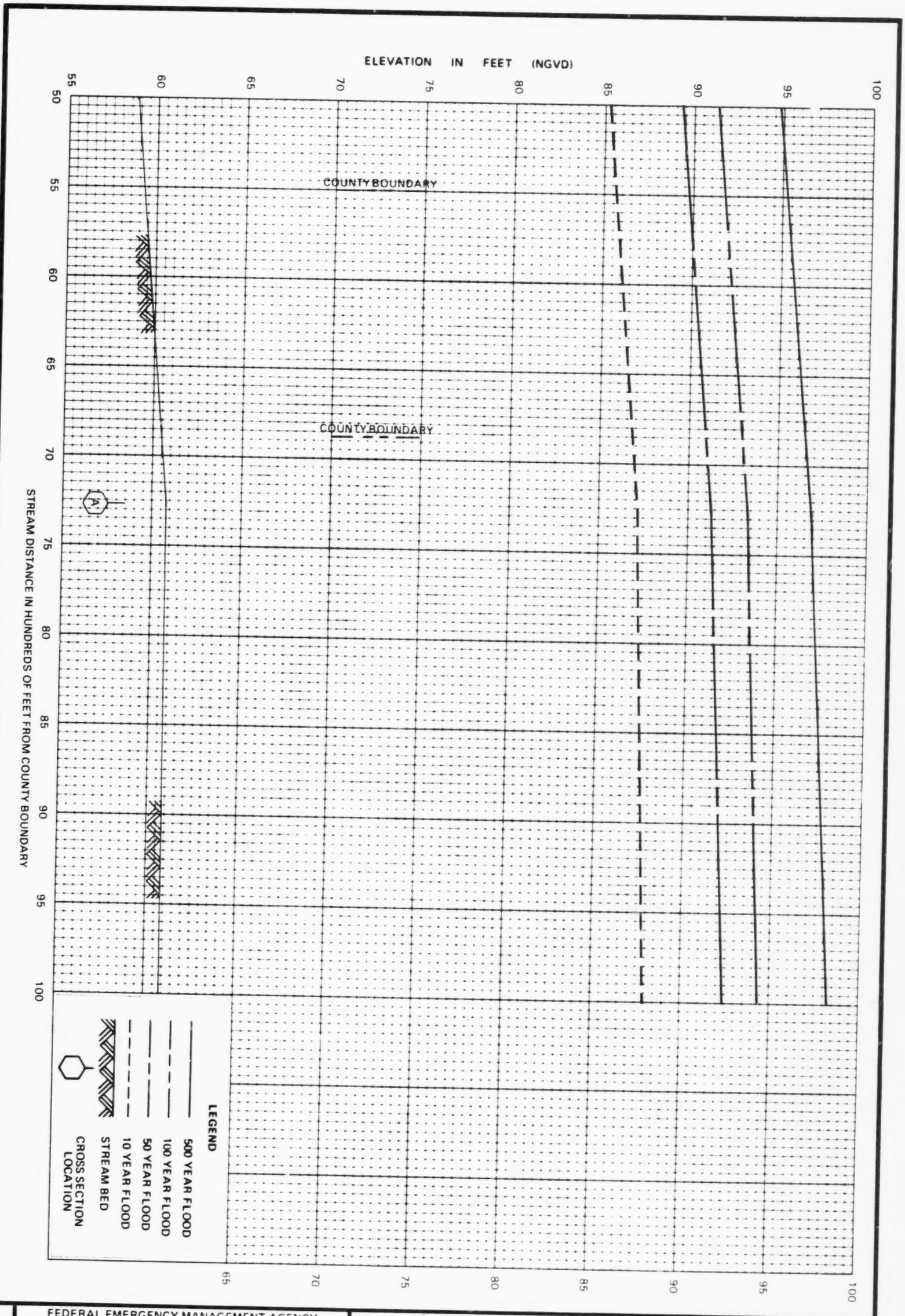
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

11P



22

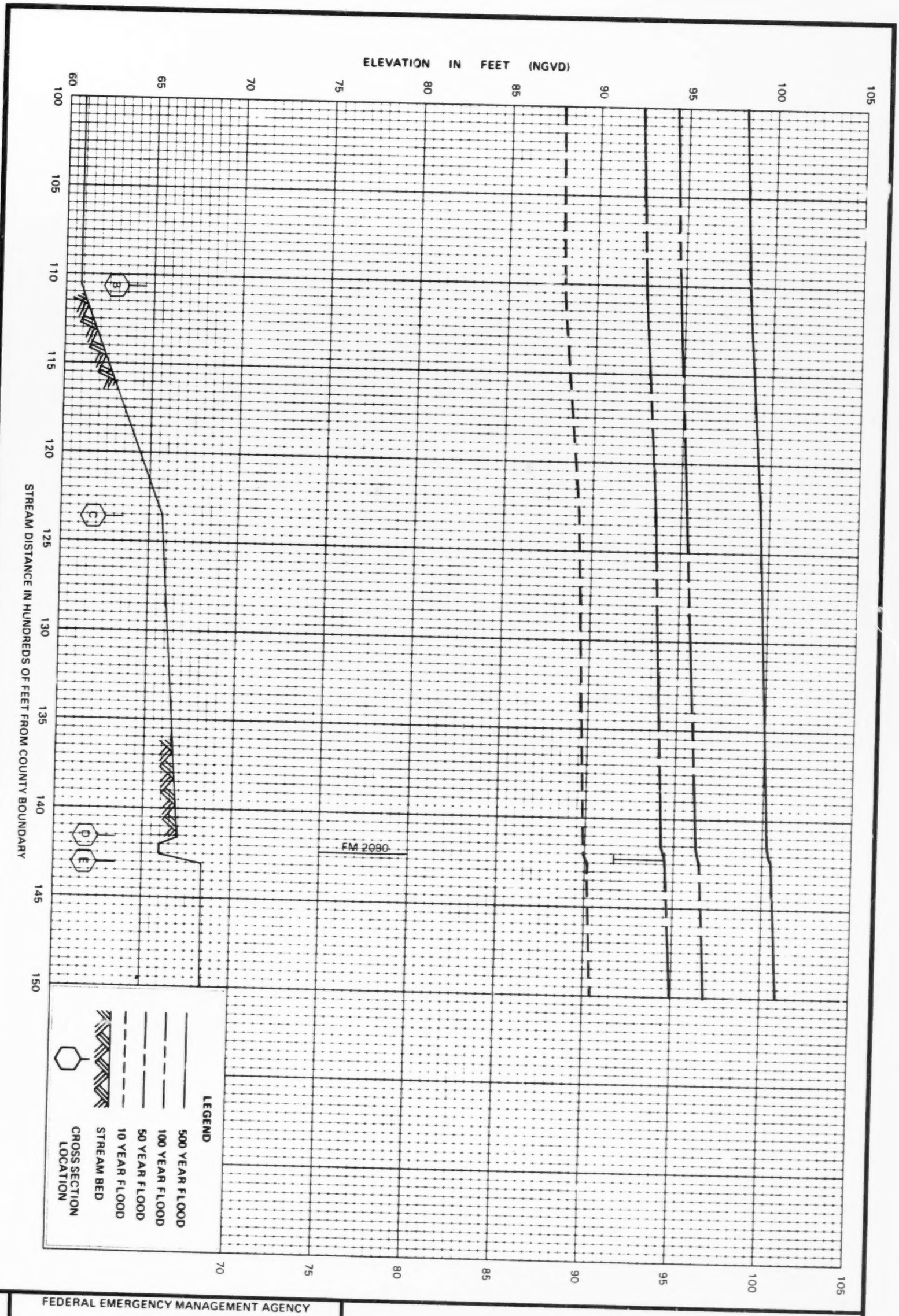
12P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER



23

13P

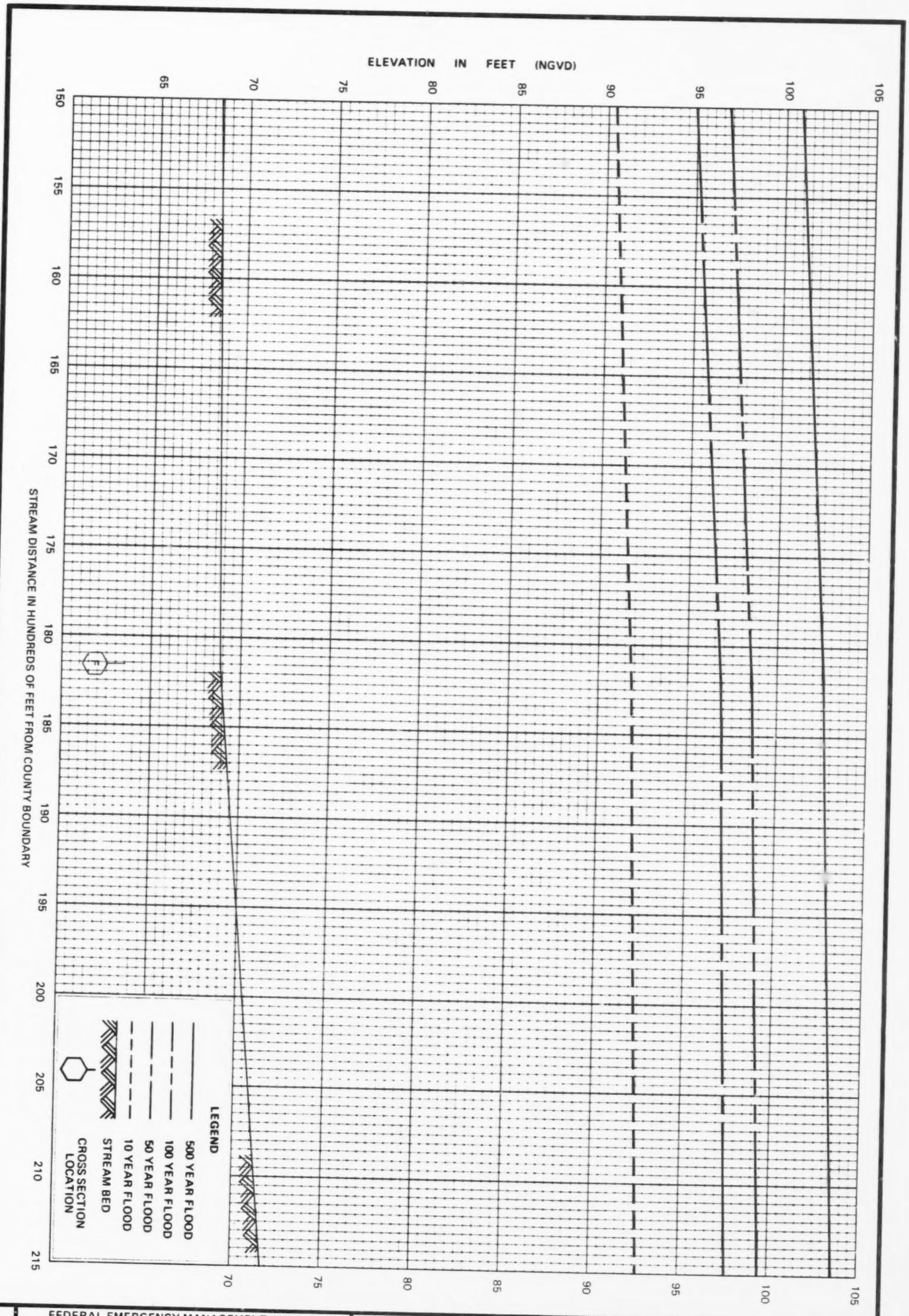
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

124488



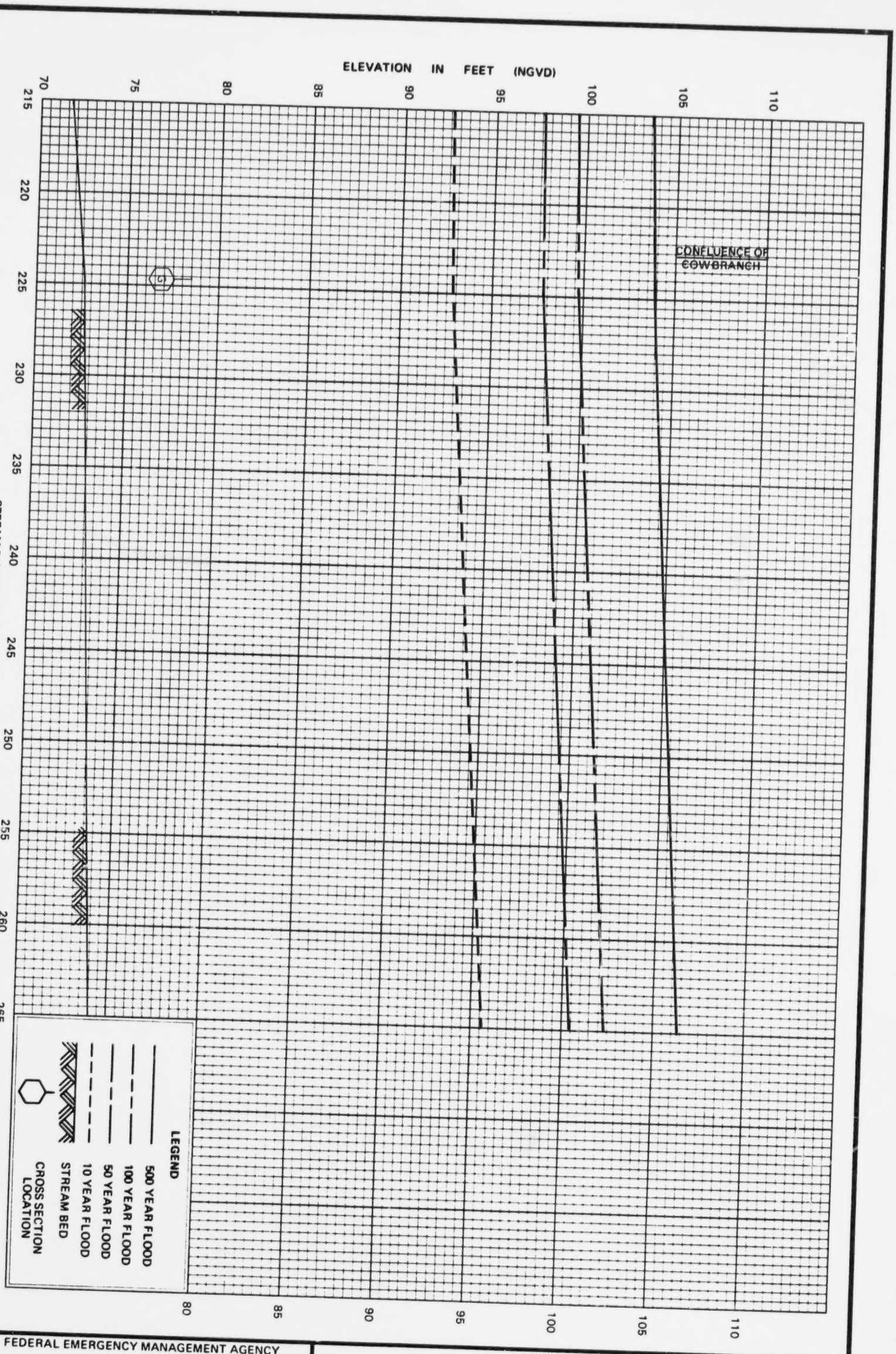
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

14P

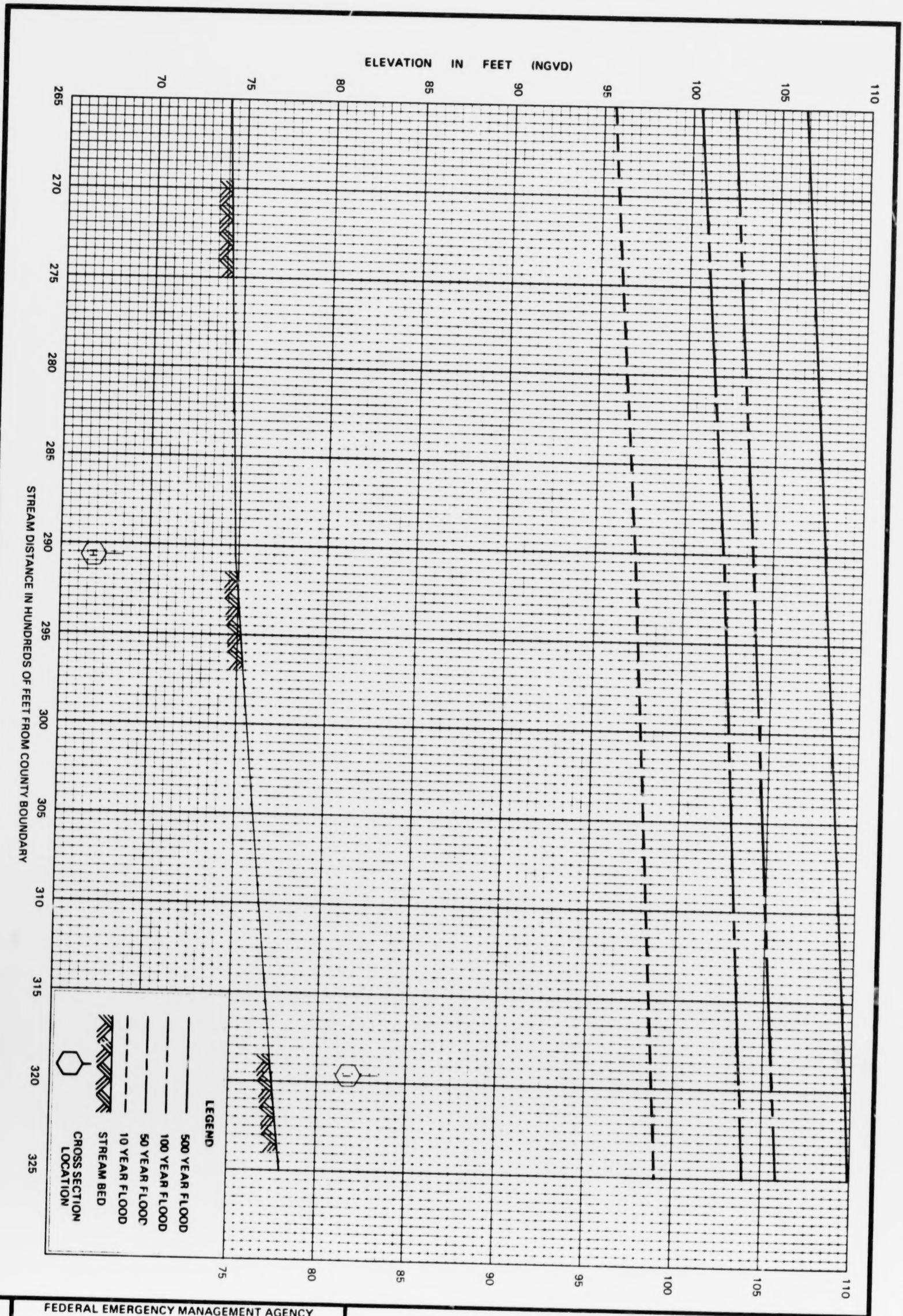


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER



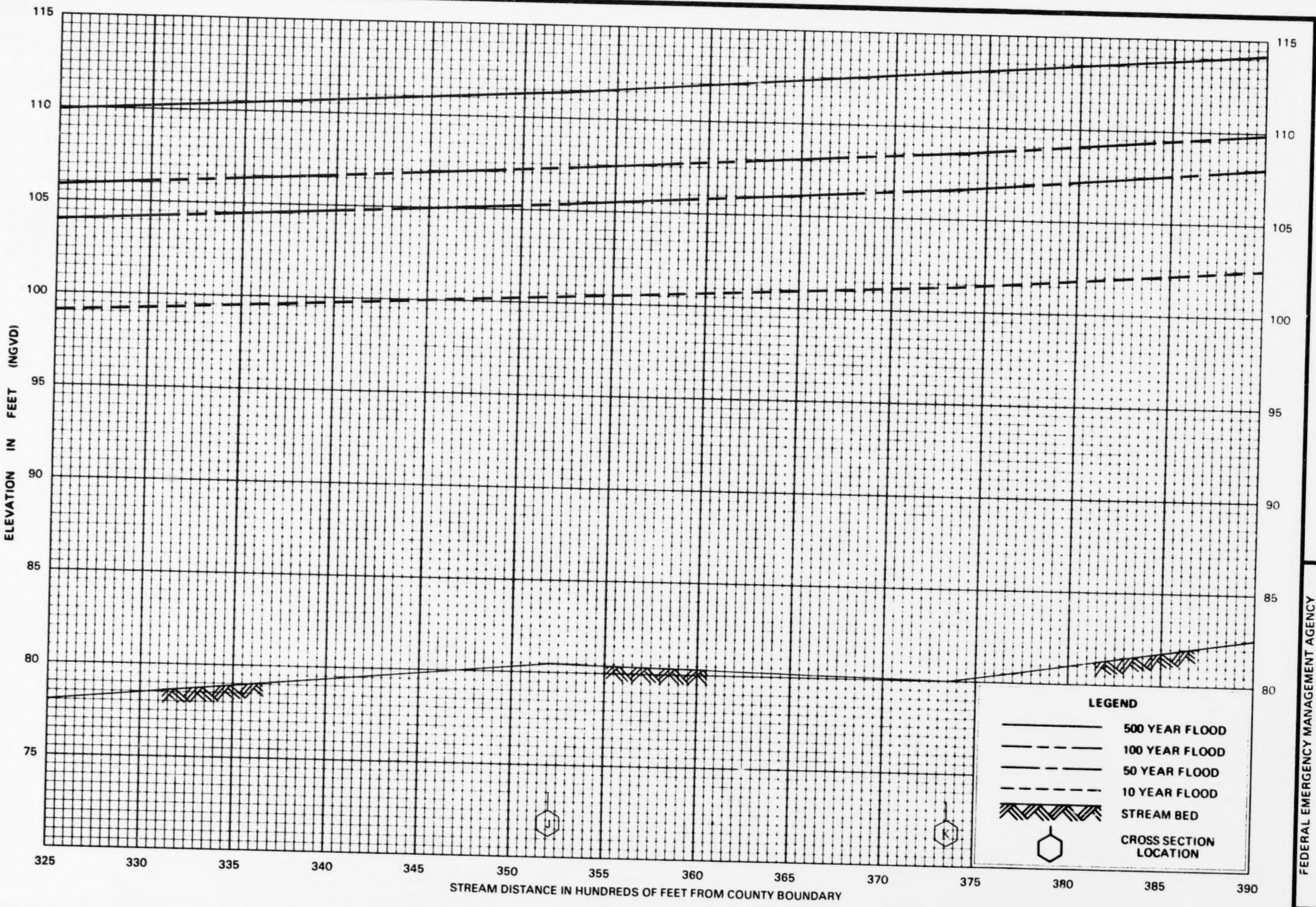
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

16P



FLOOD PROFILES

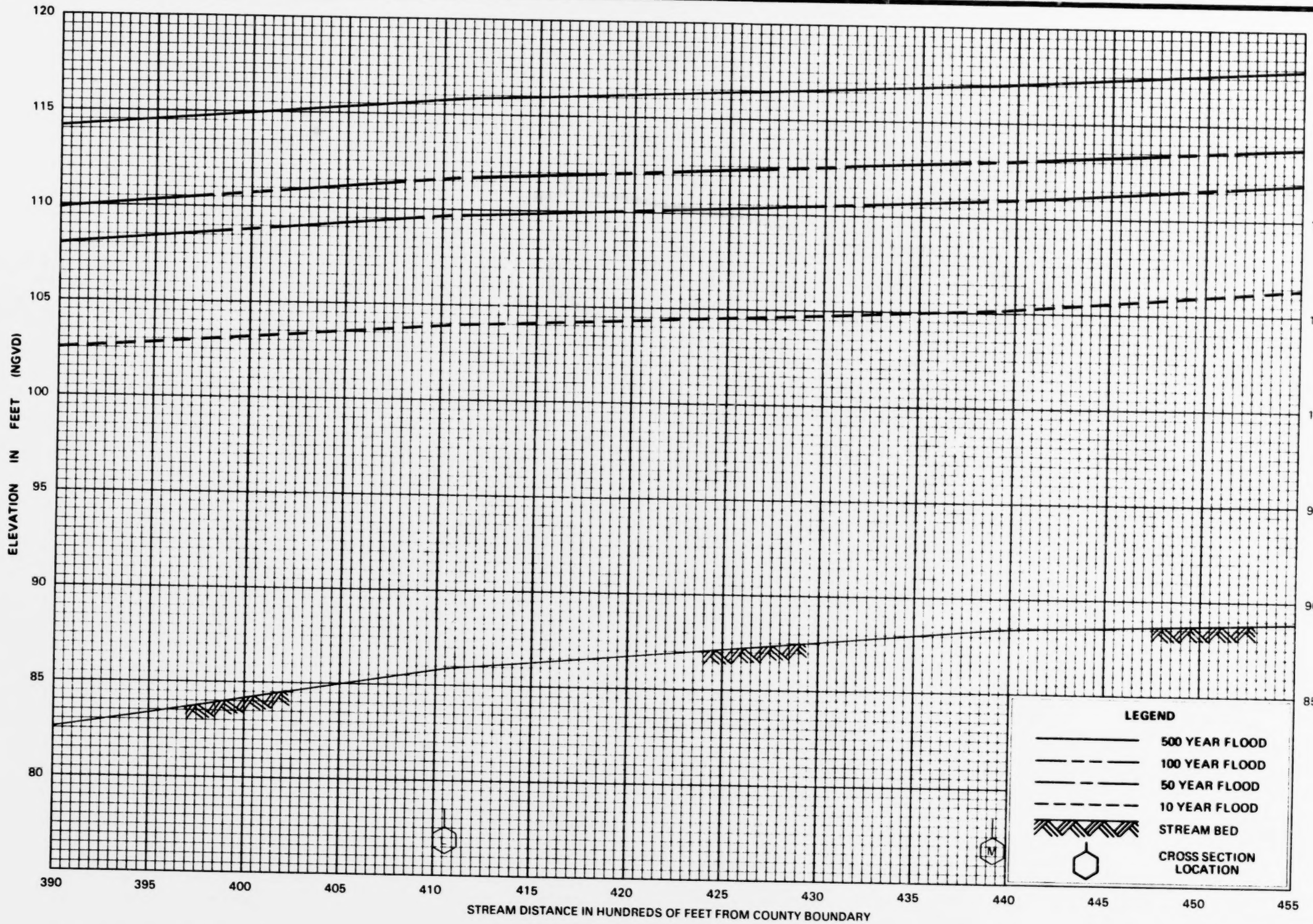
EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

17P

124466



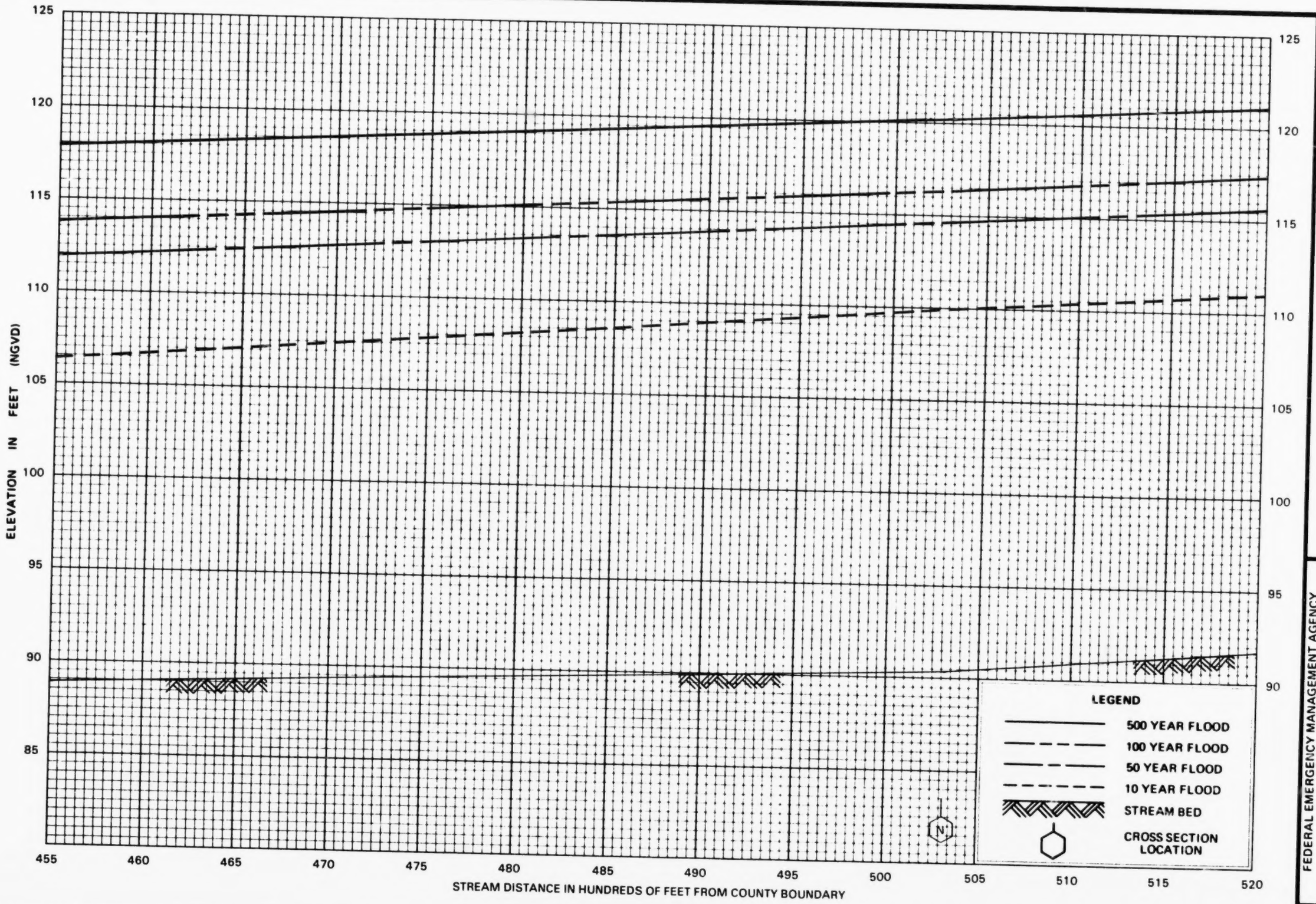
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

18P



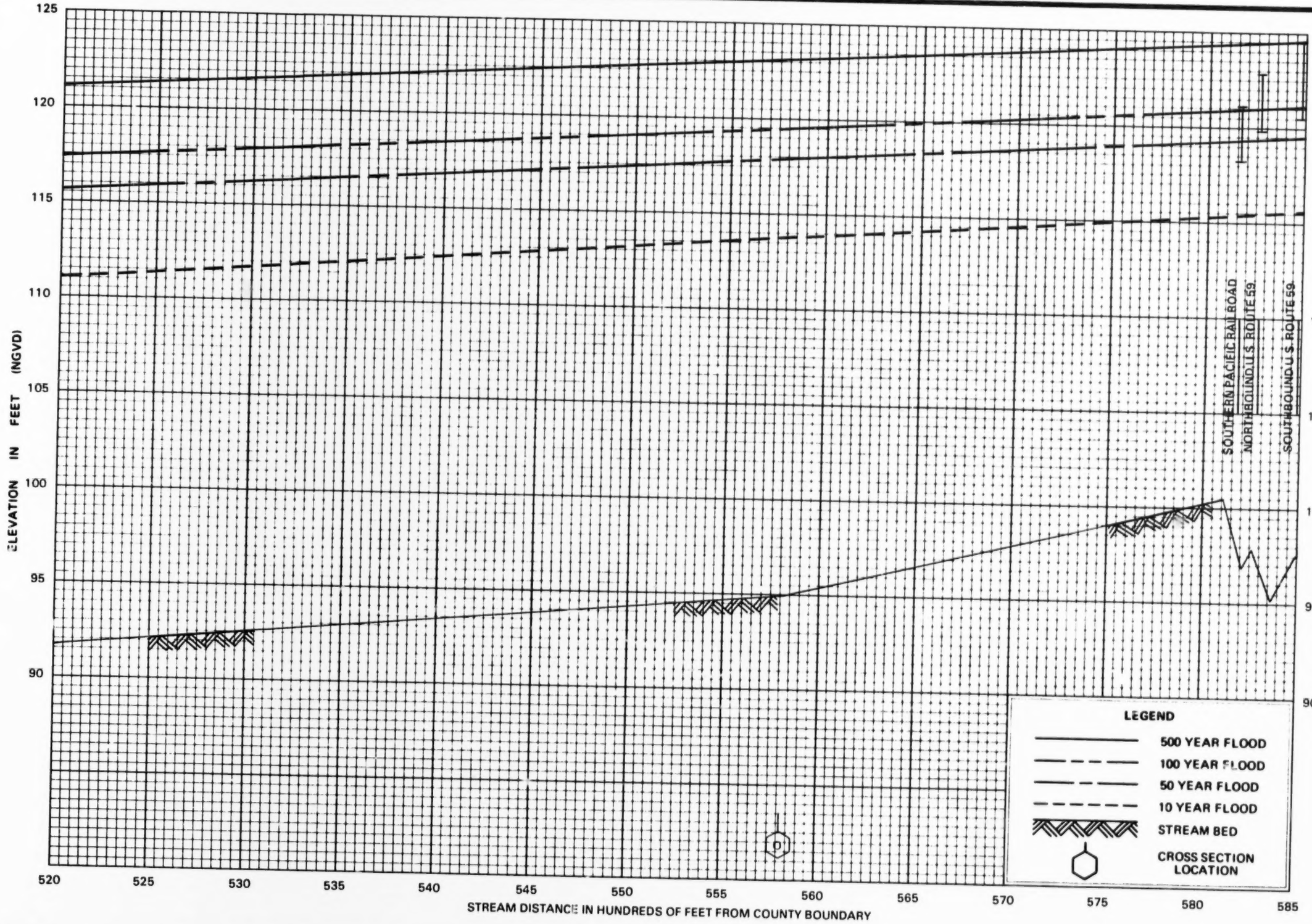
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

19P



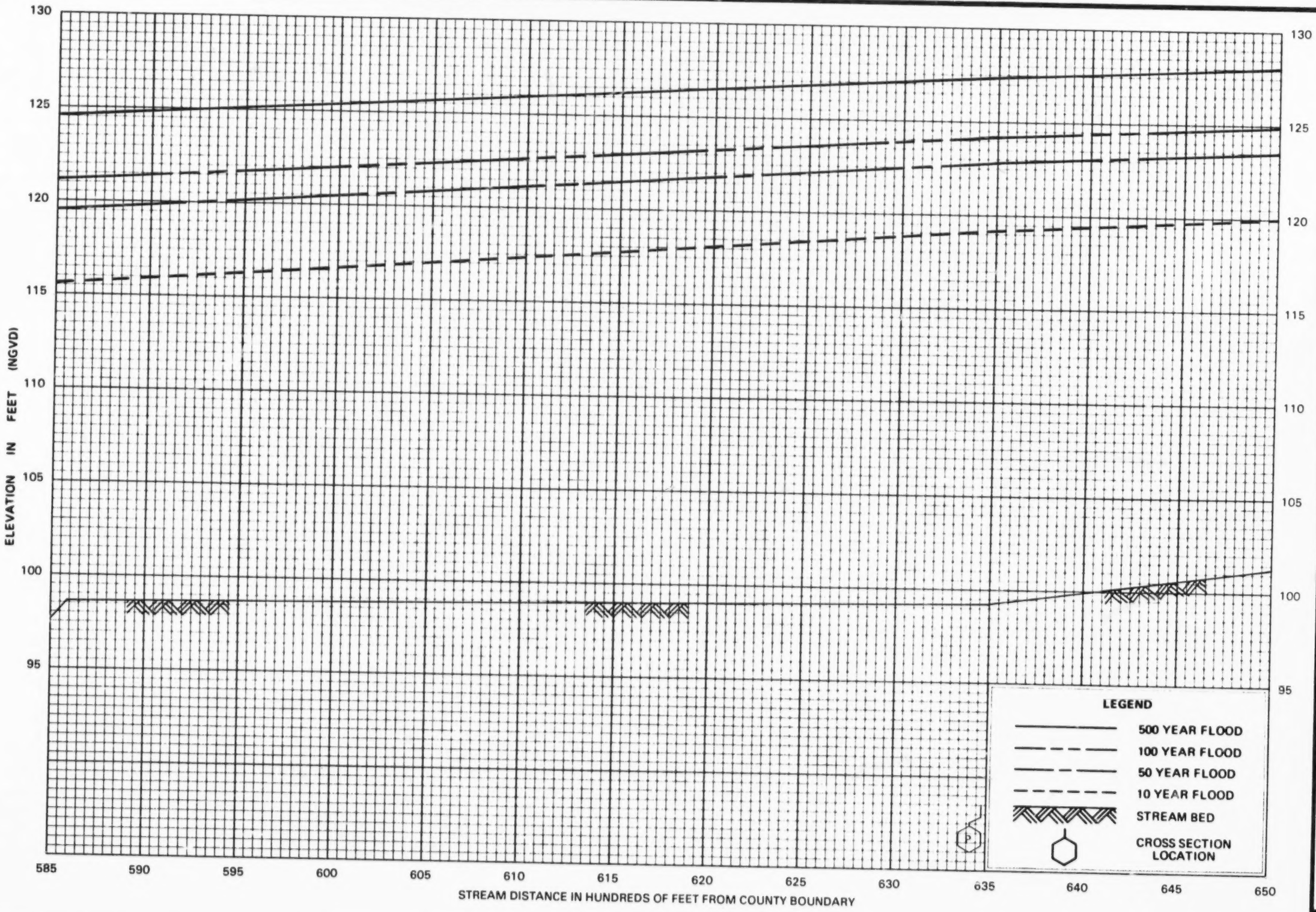
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

20P



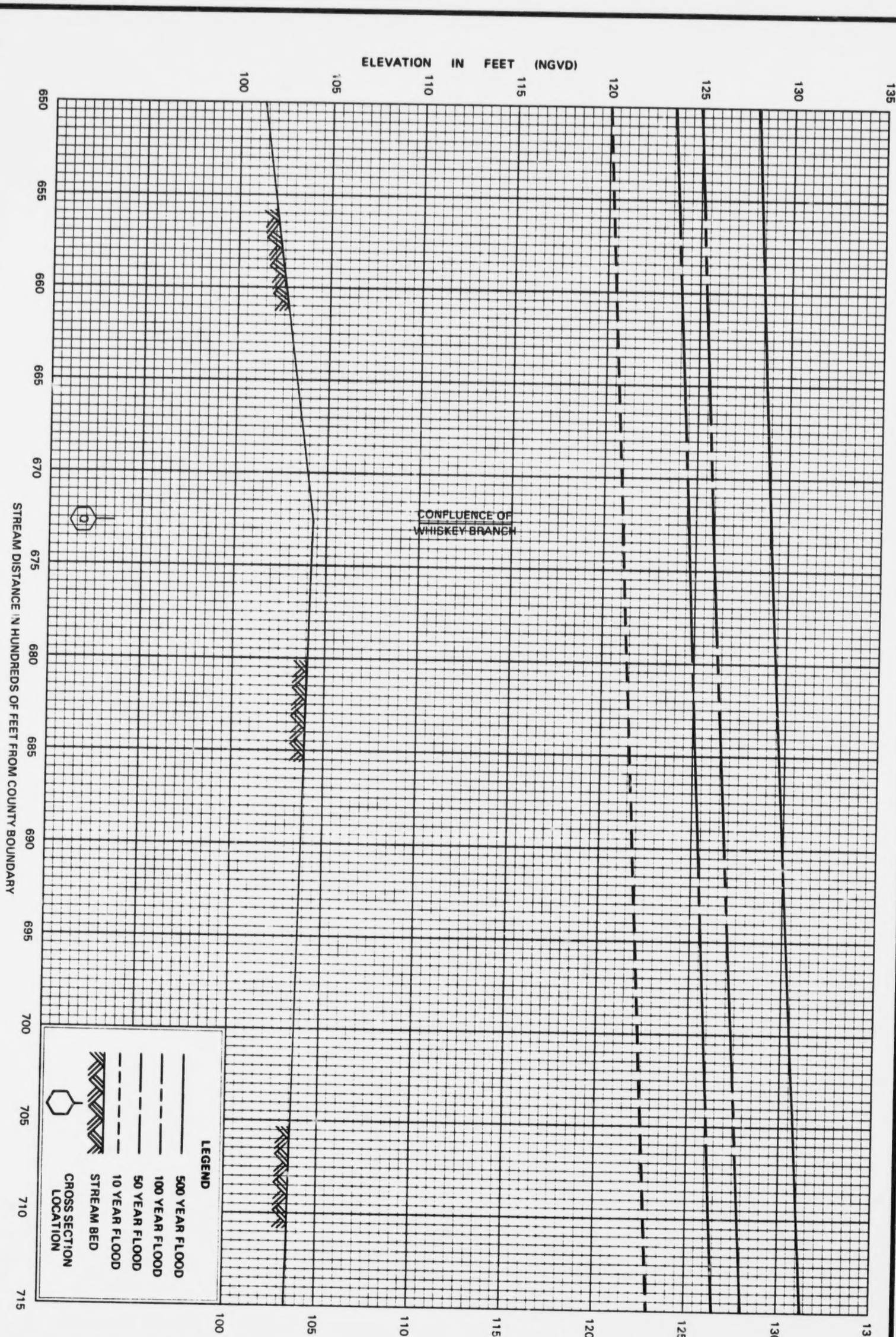
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

21P



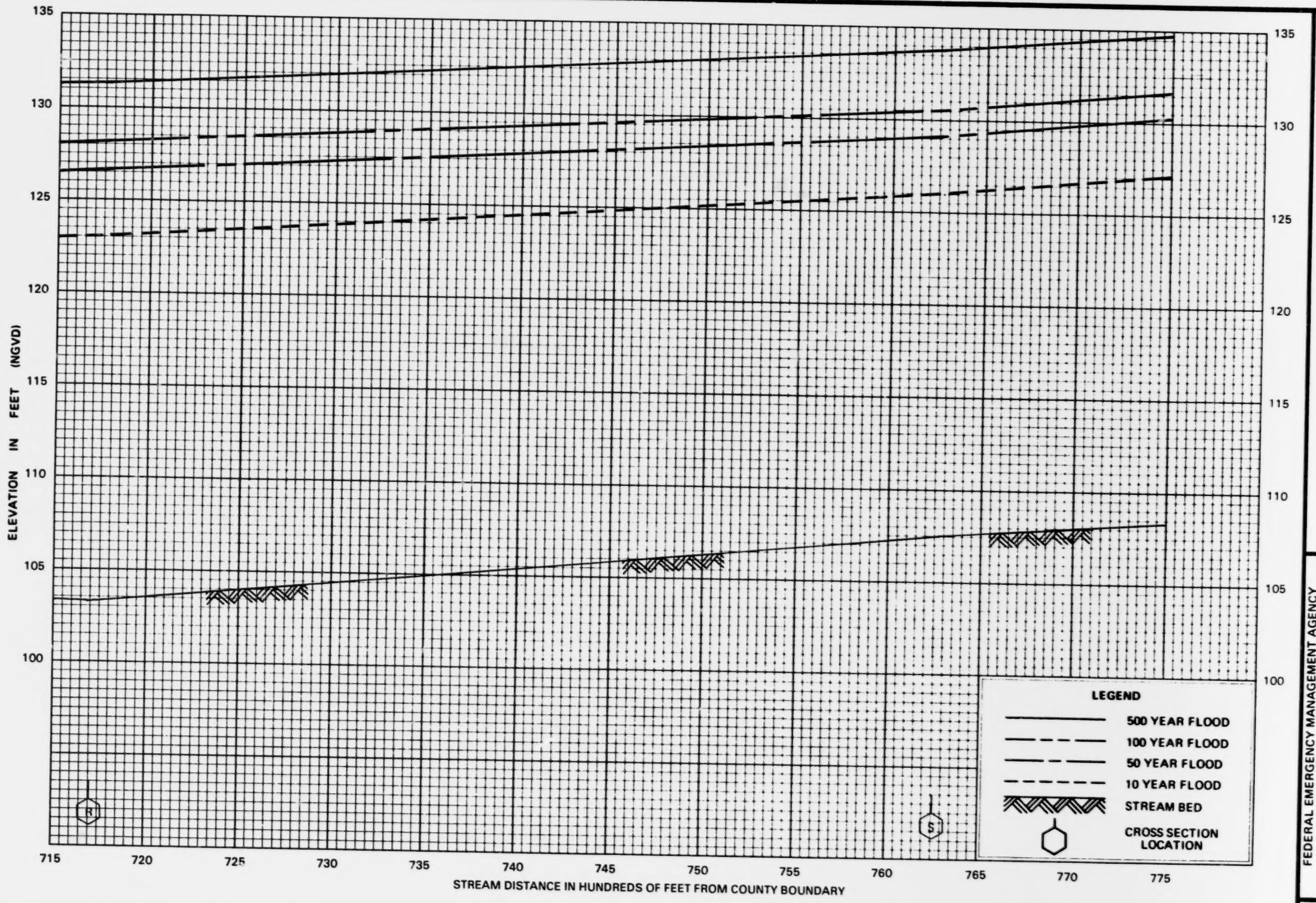
22P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER



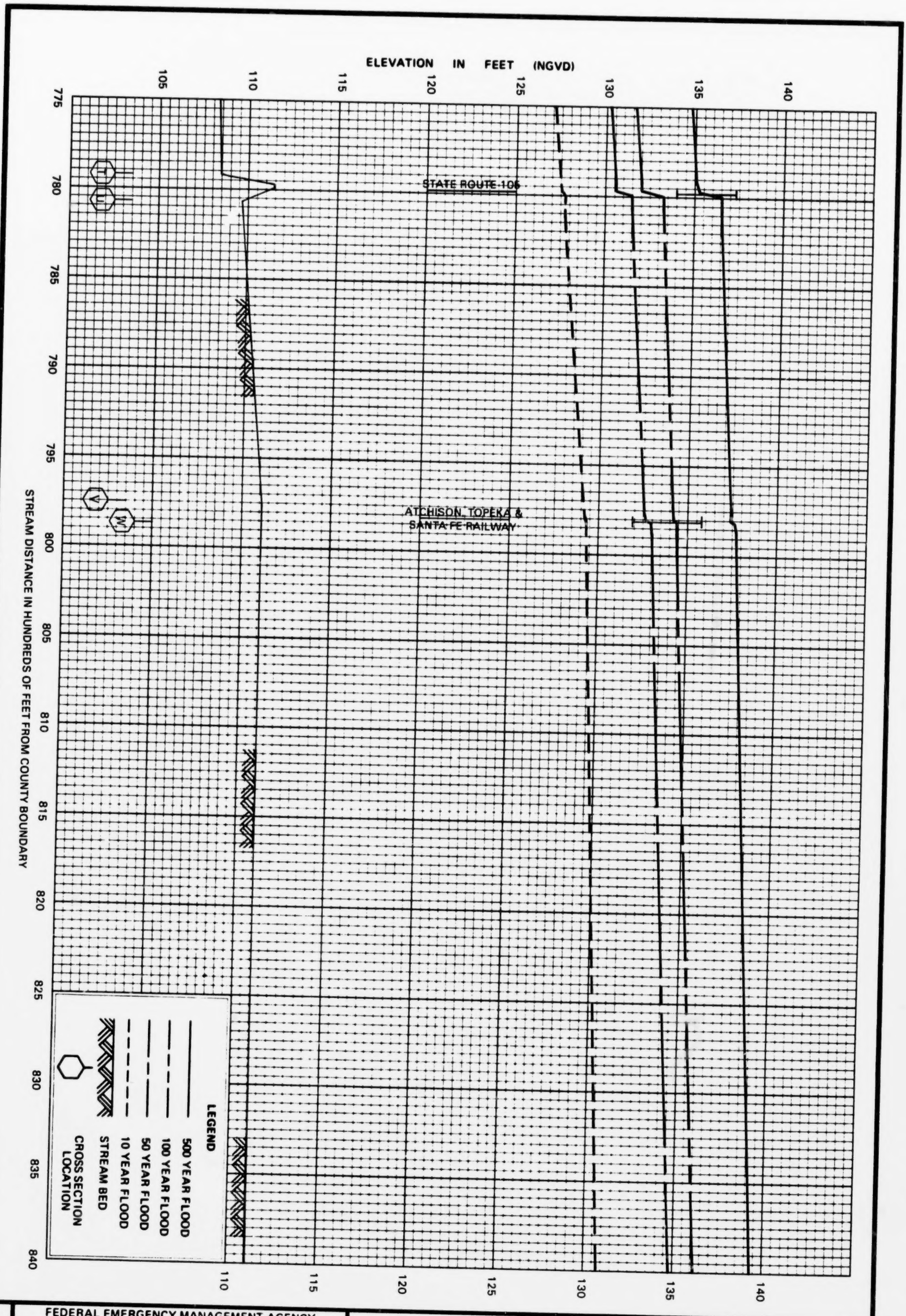
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

23P



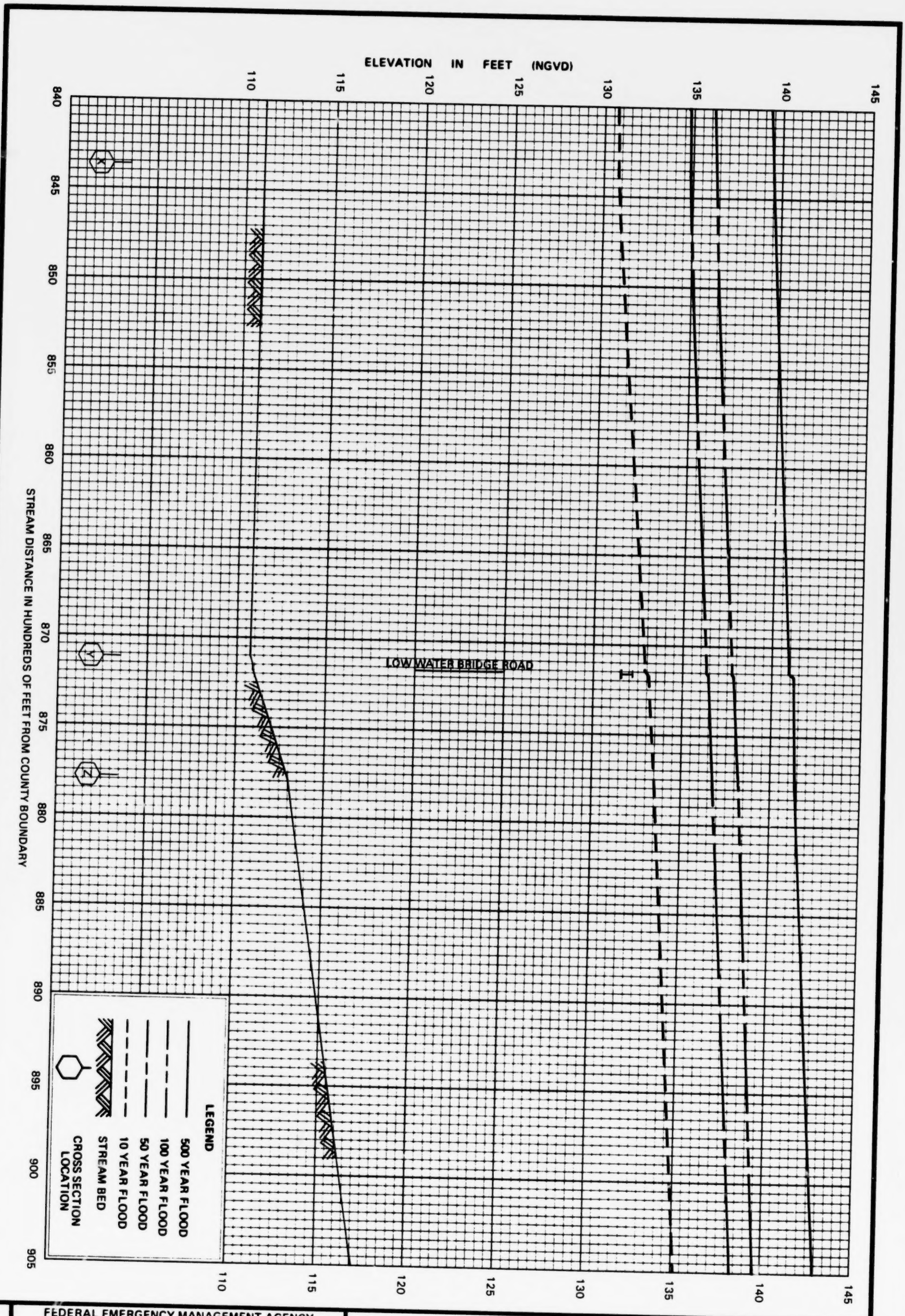
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

24P



FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

25P

ELEVATION IN FEET (NGVD)

145
140
135
130
125
120
115
110

COUNTY BOUNDARY

AA
AB

905 910 915 920 925 930 935 940

STREAM DISTANCE IN HUNDREDS OF FEET FROM COUNTY BOUNDARY

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

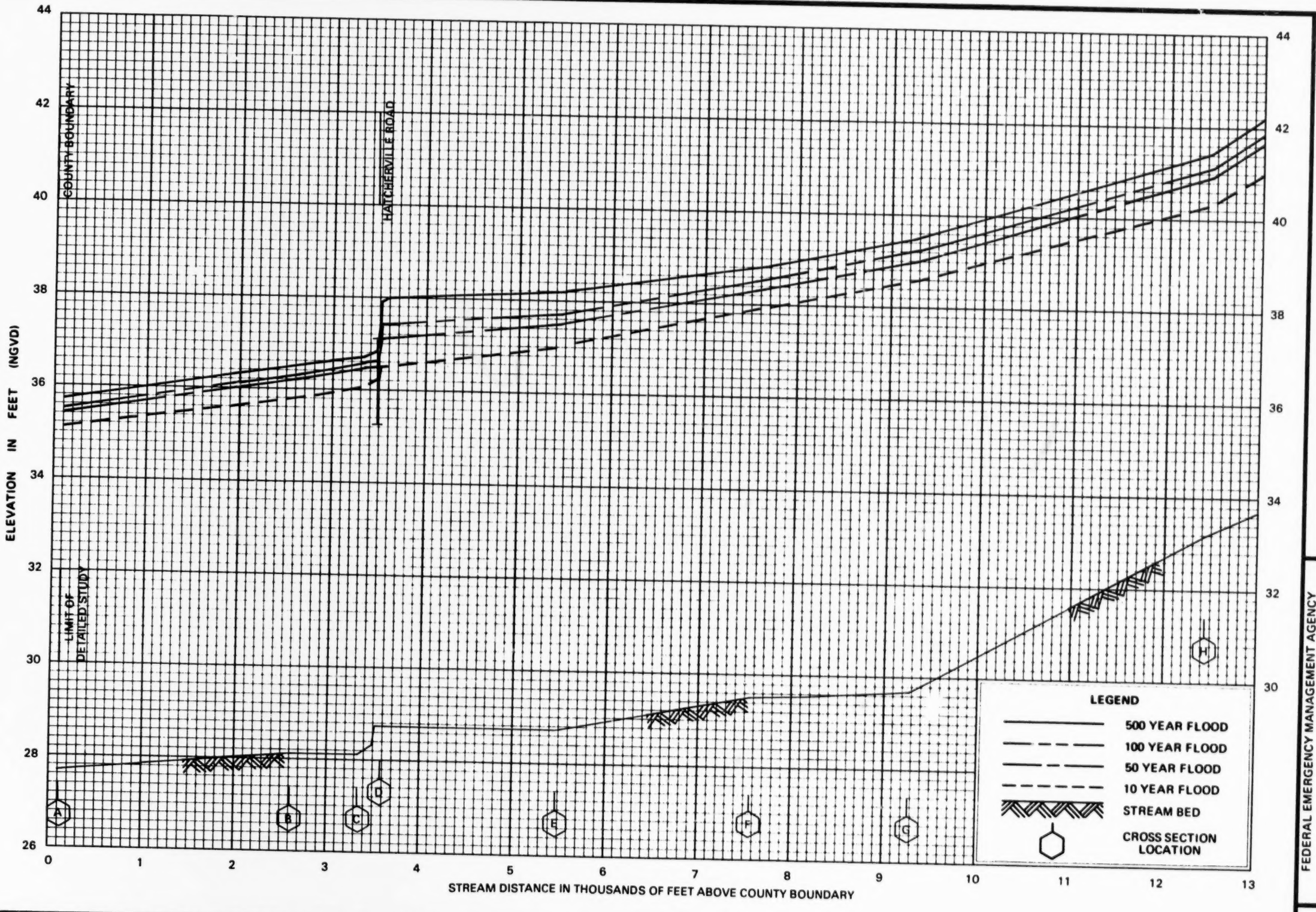
FLOOD PROFILES

EAST FORK SAN JACINTO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

26P



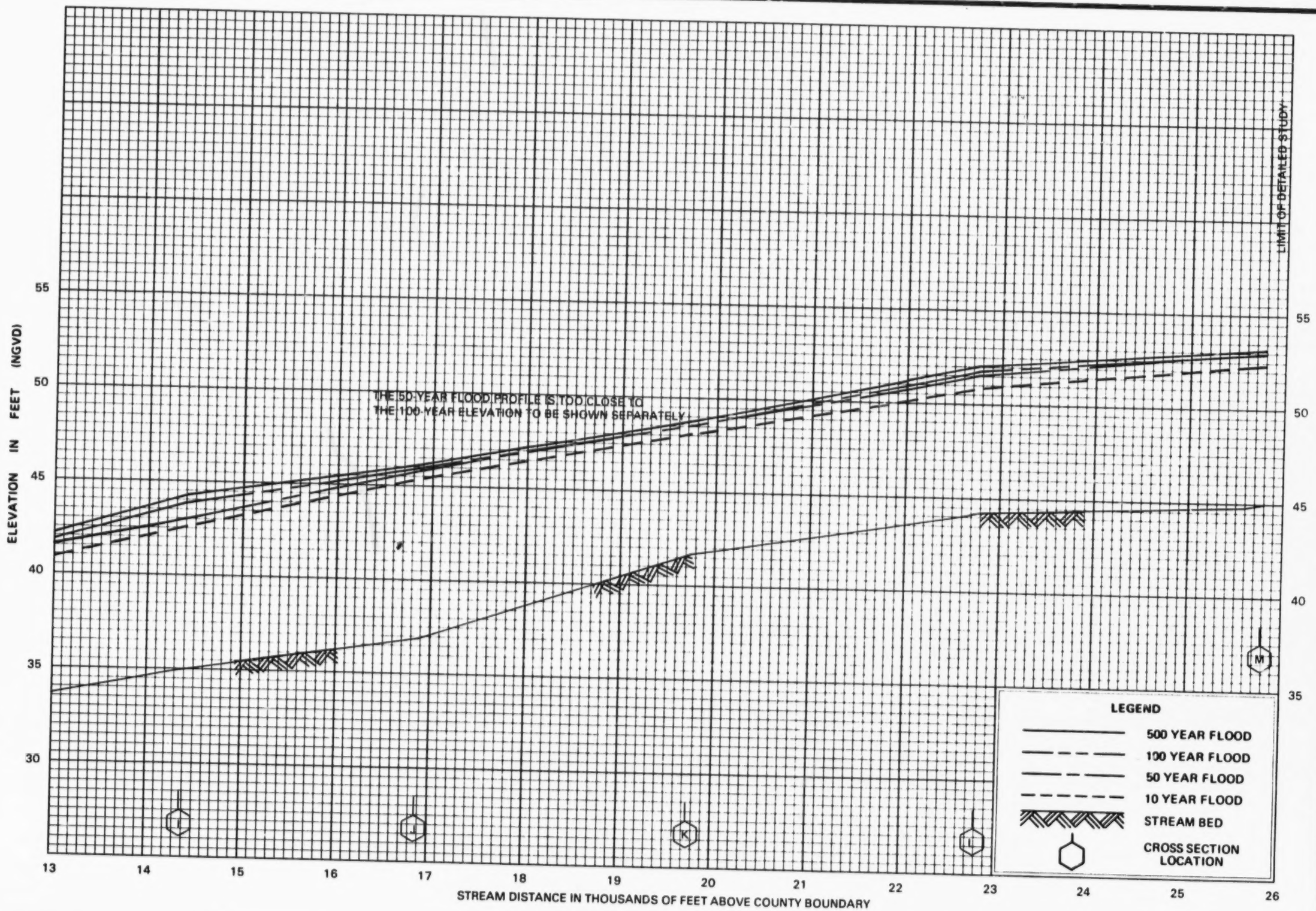
FLOOD PROFILES

HICKORY ISLAND GULLY

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

27P



FLOOD PROFILES

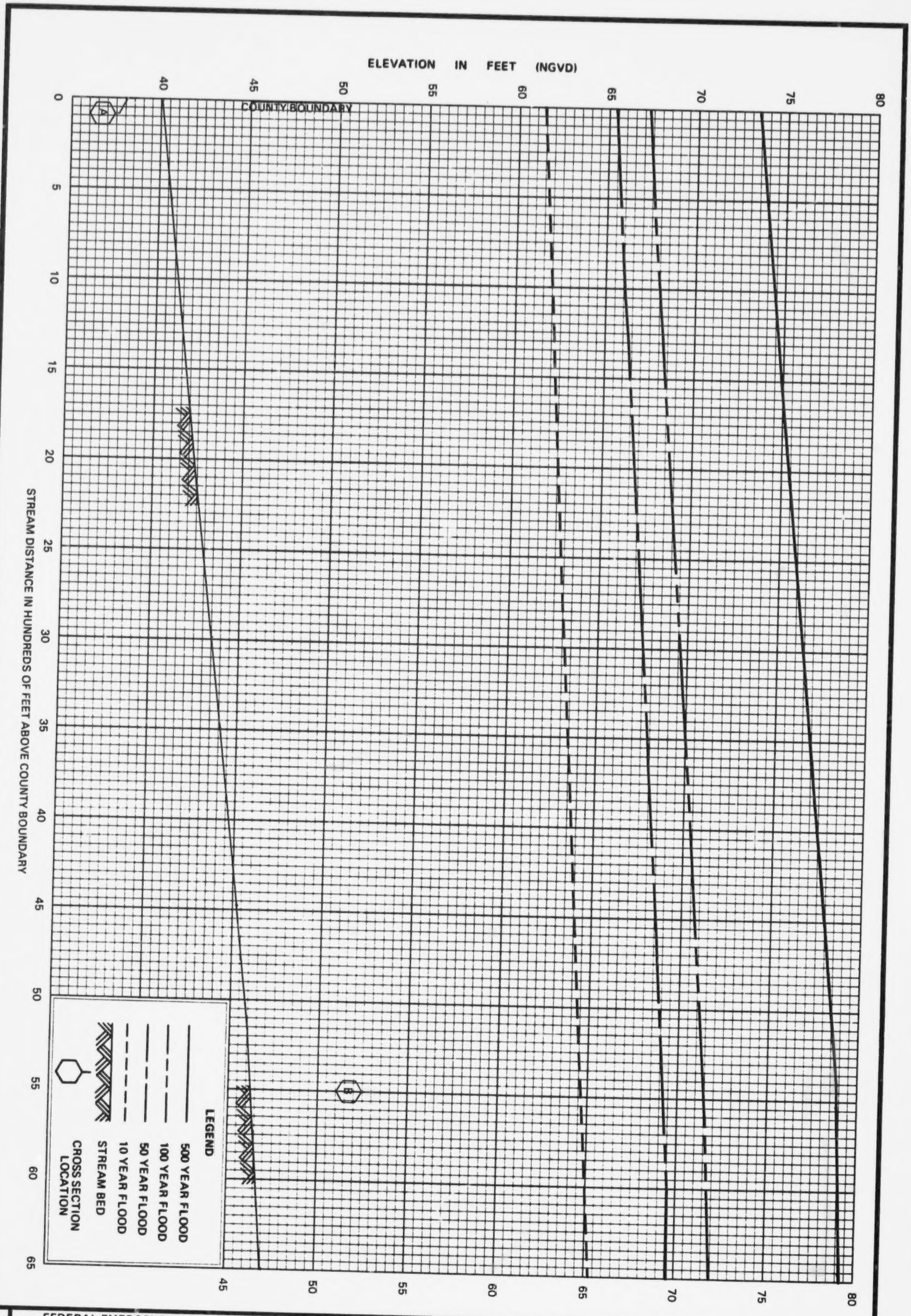
HICKORY ISLAND GULLY

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

28P



FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU

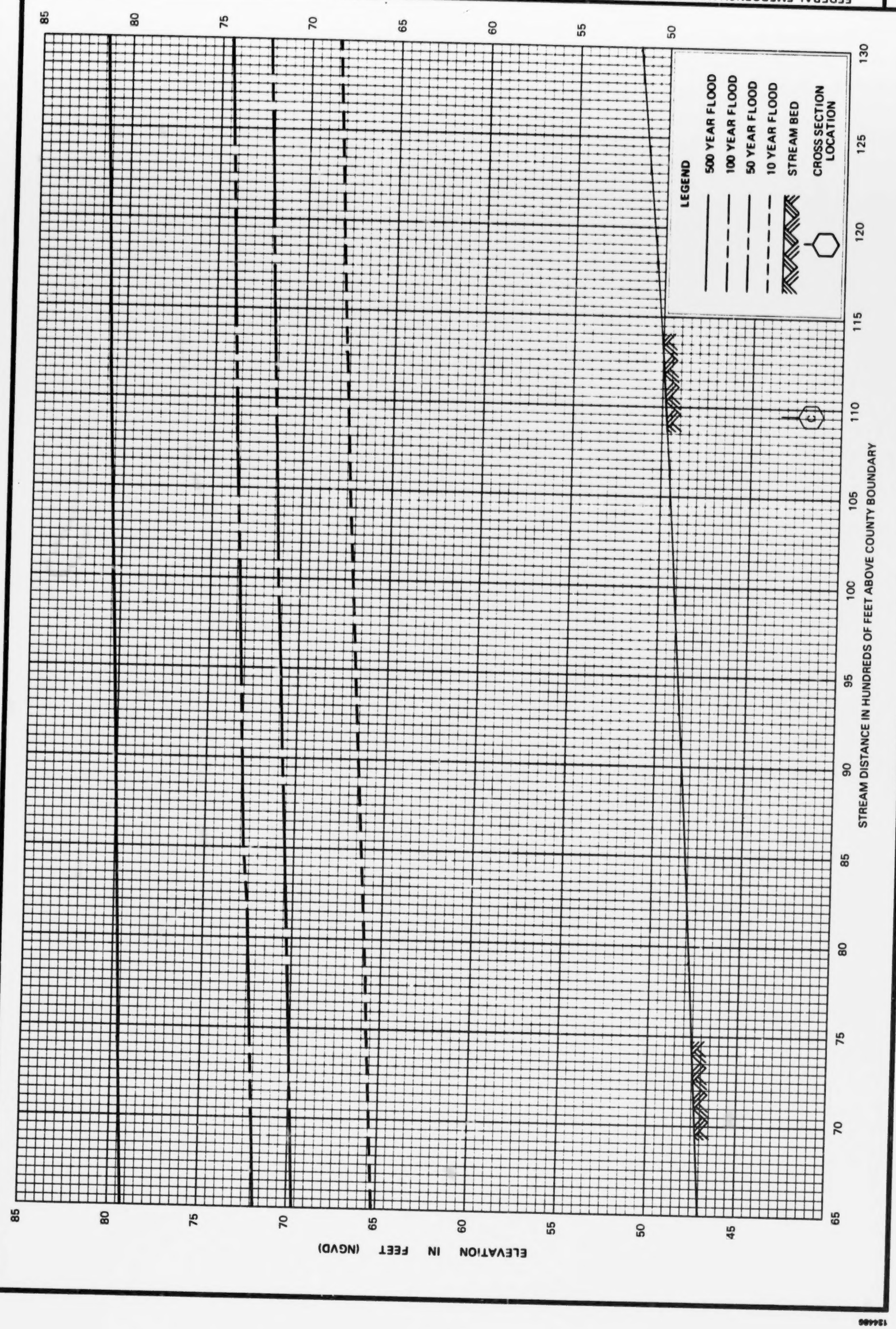
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

30P

FLOOD PROFILES

LUCE BAYOU



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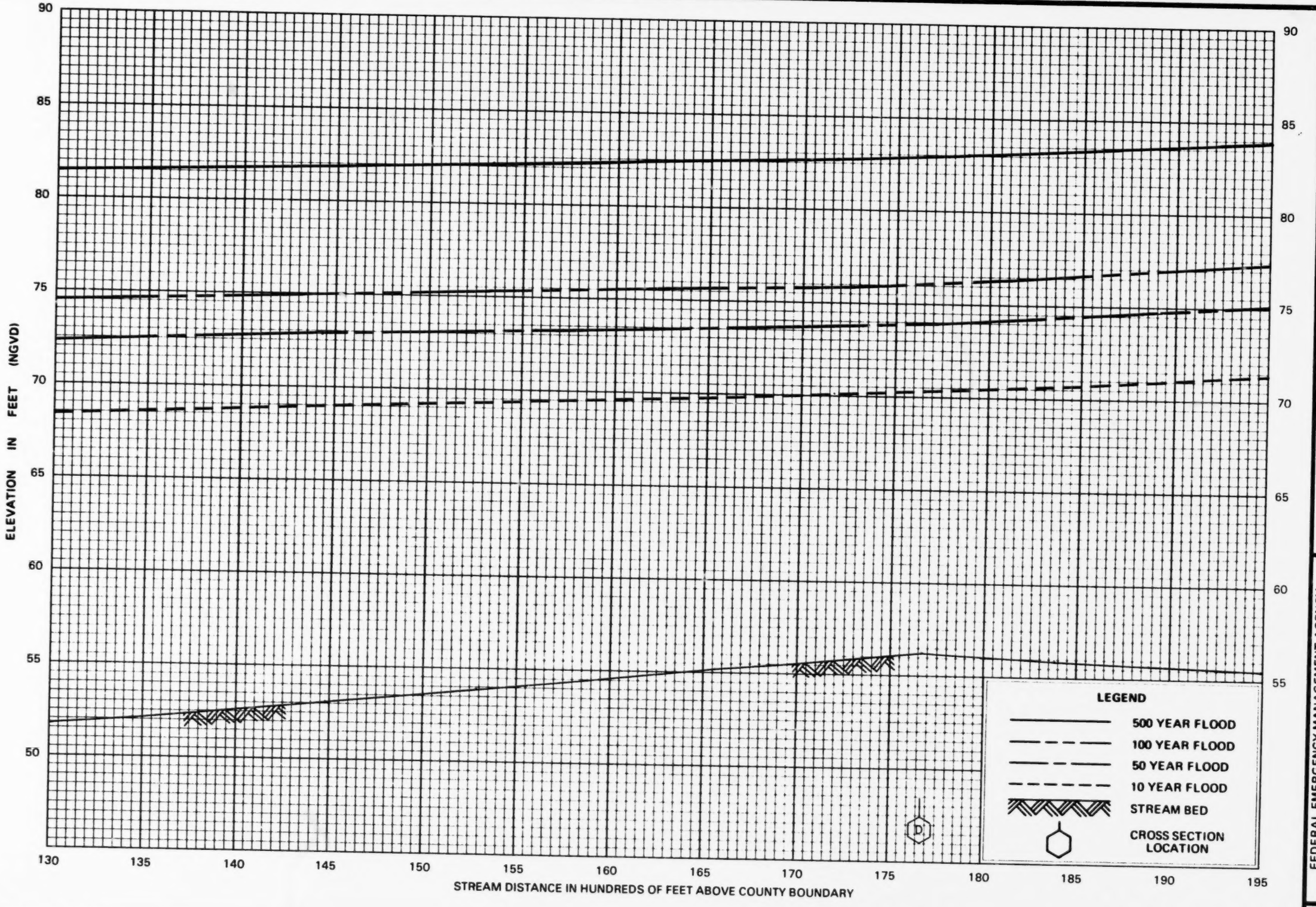


FLOOD PROFILES

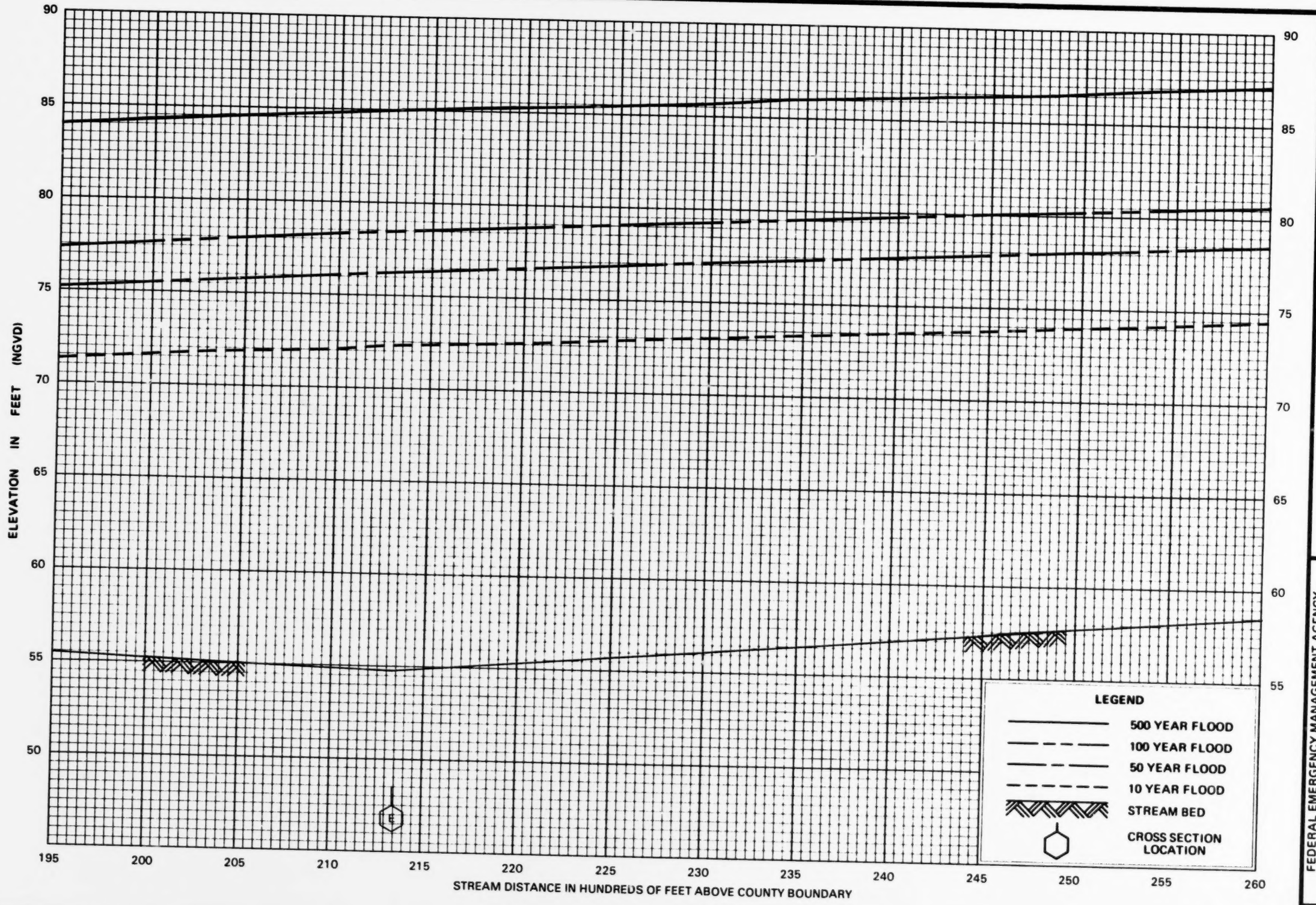
LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

31P

124466



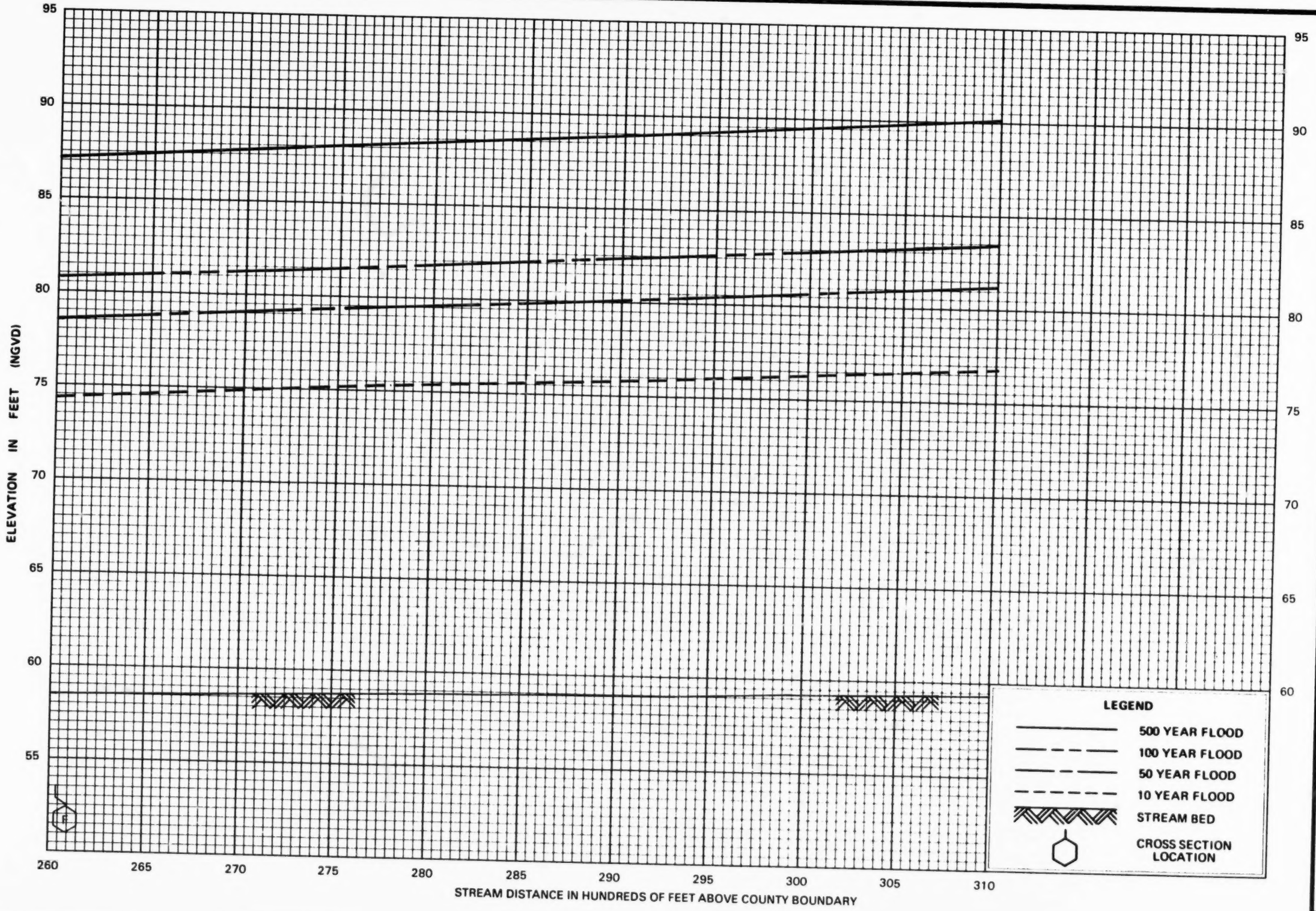
FLOOD PROFILES

LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

32P



FLOOD PROFILES

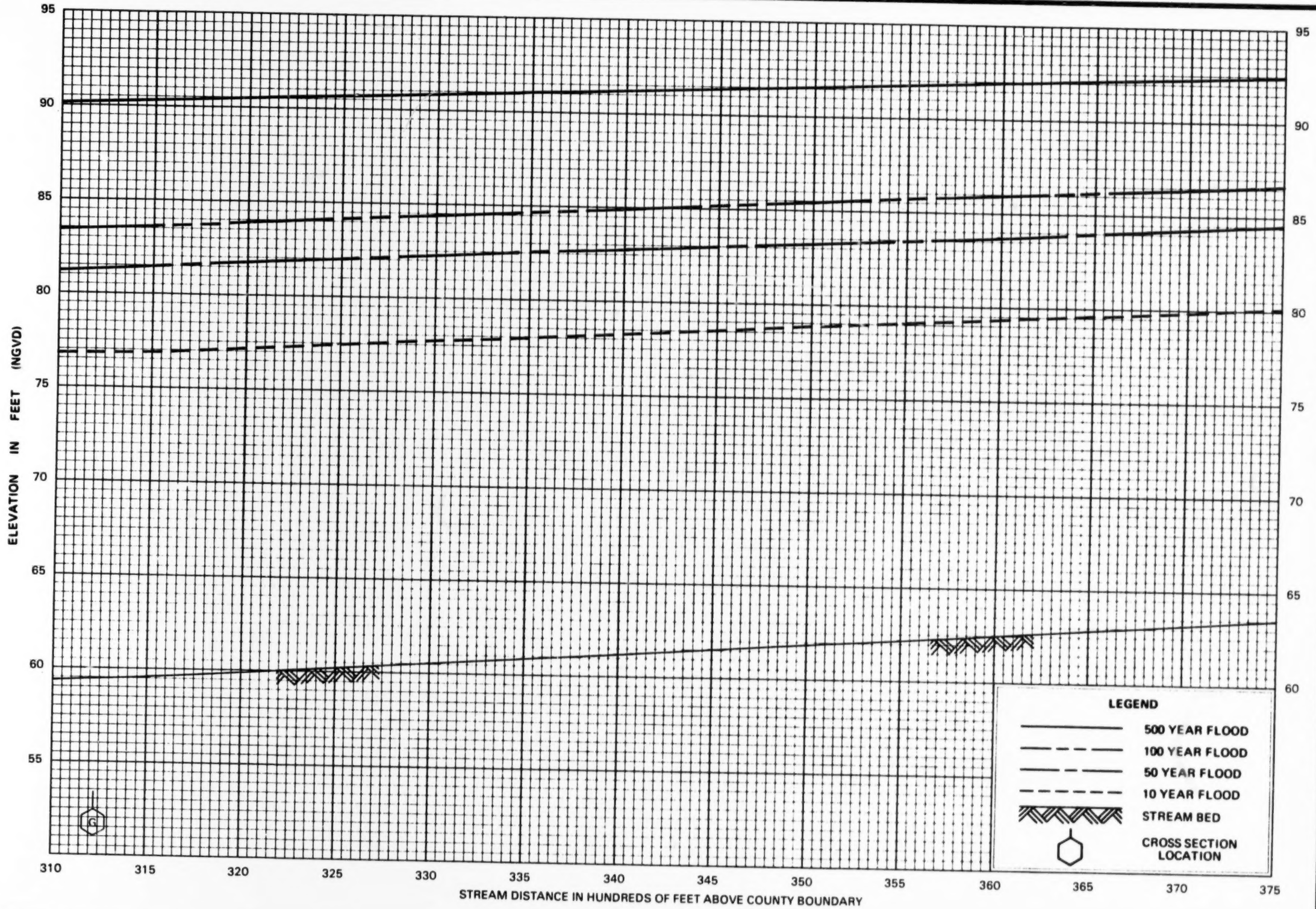
LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

33P

124426



FLOOD PROFILES

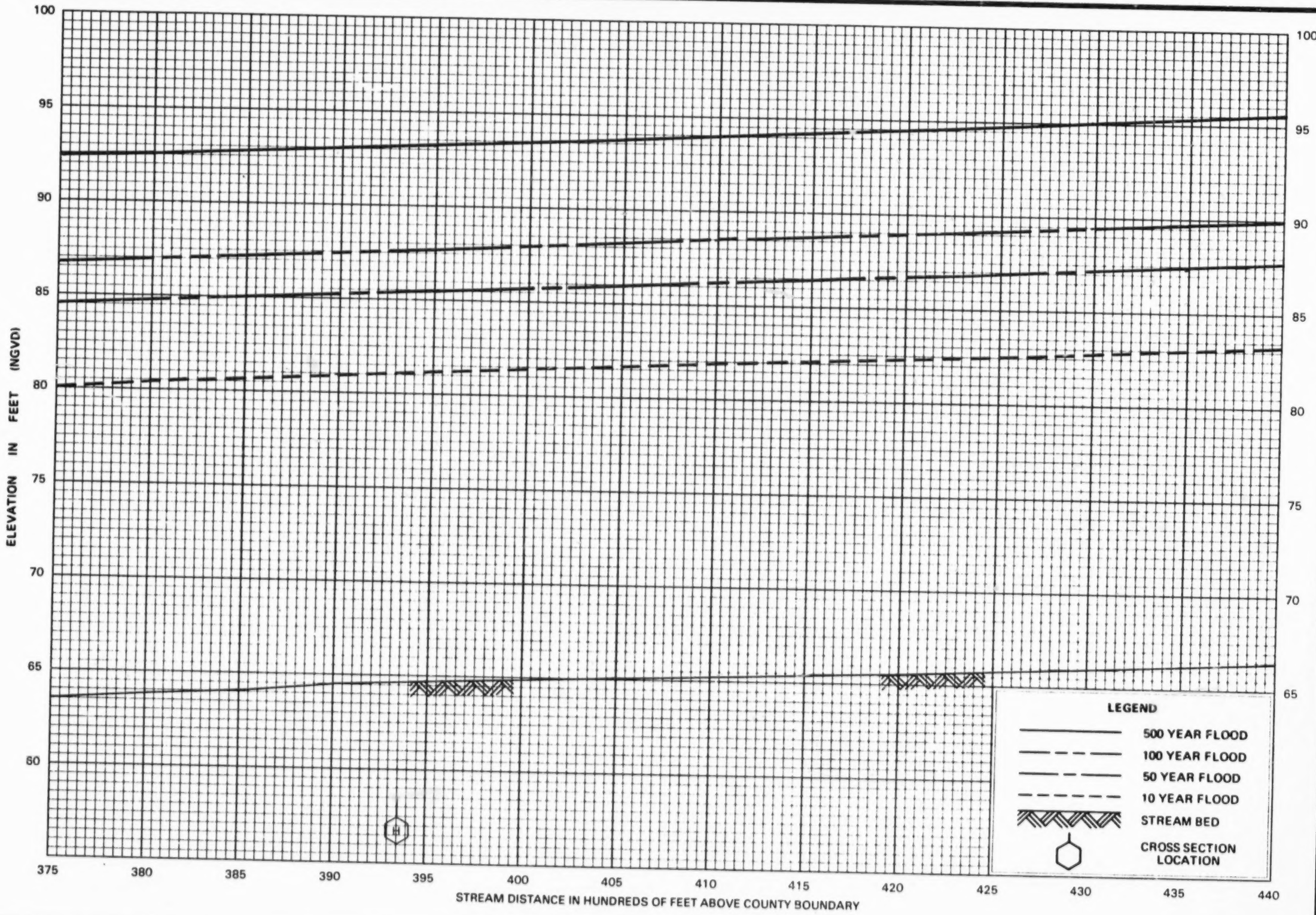
LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

34P

124488



FLOOD PROFILES

LUCE BAYOU

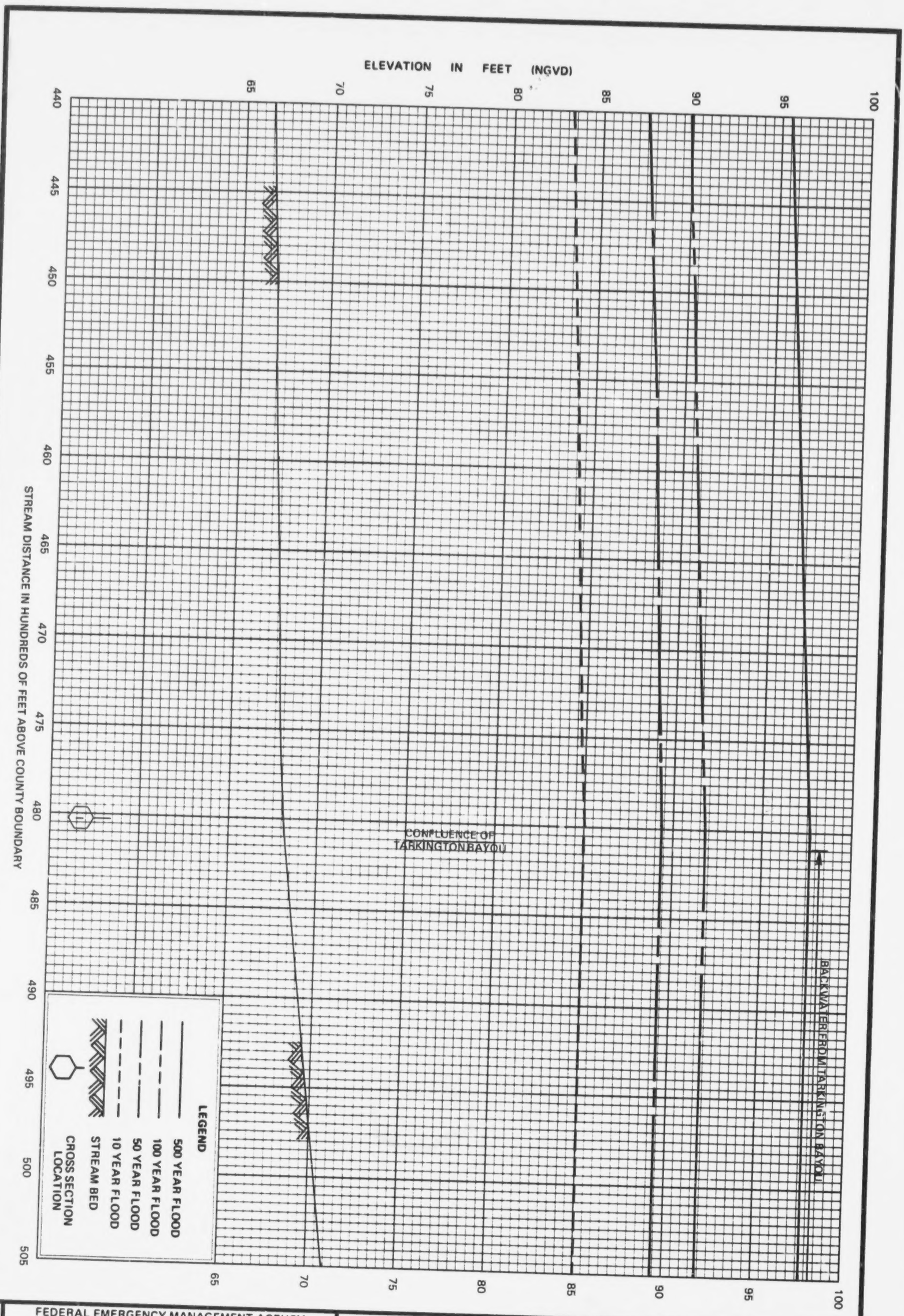
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

35P

124488

95



FEDERAL EMERGENCY MANAGEMENT AGENCY

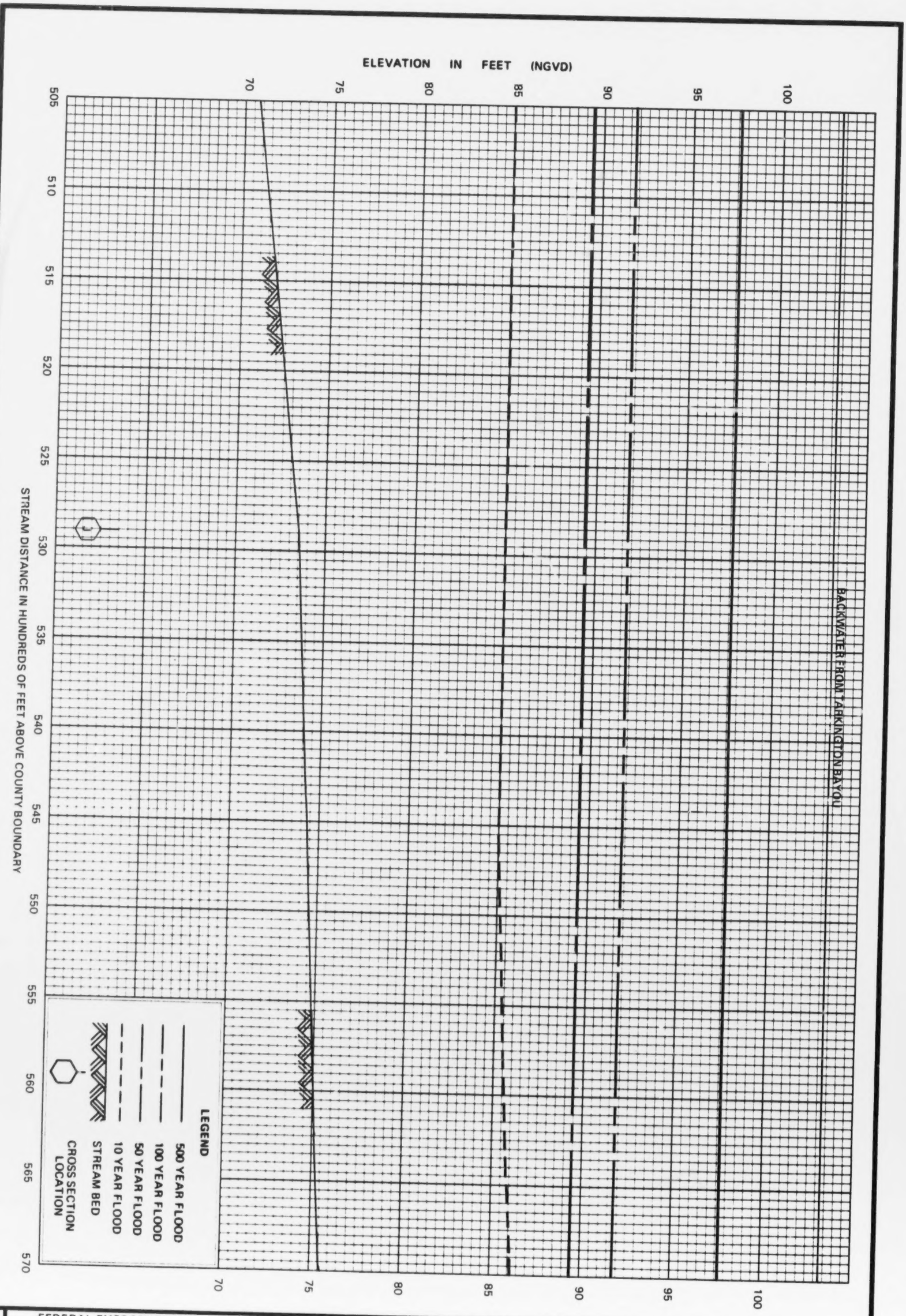
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU

36P

96



92

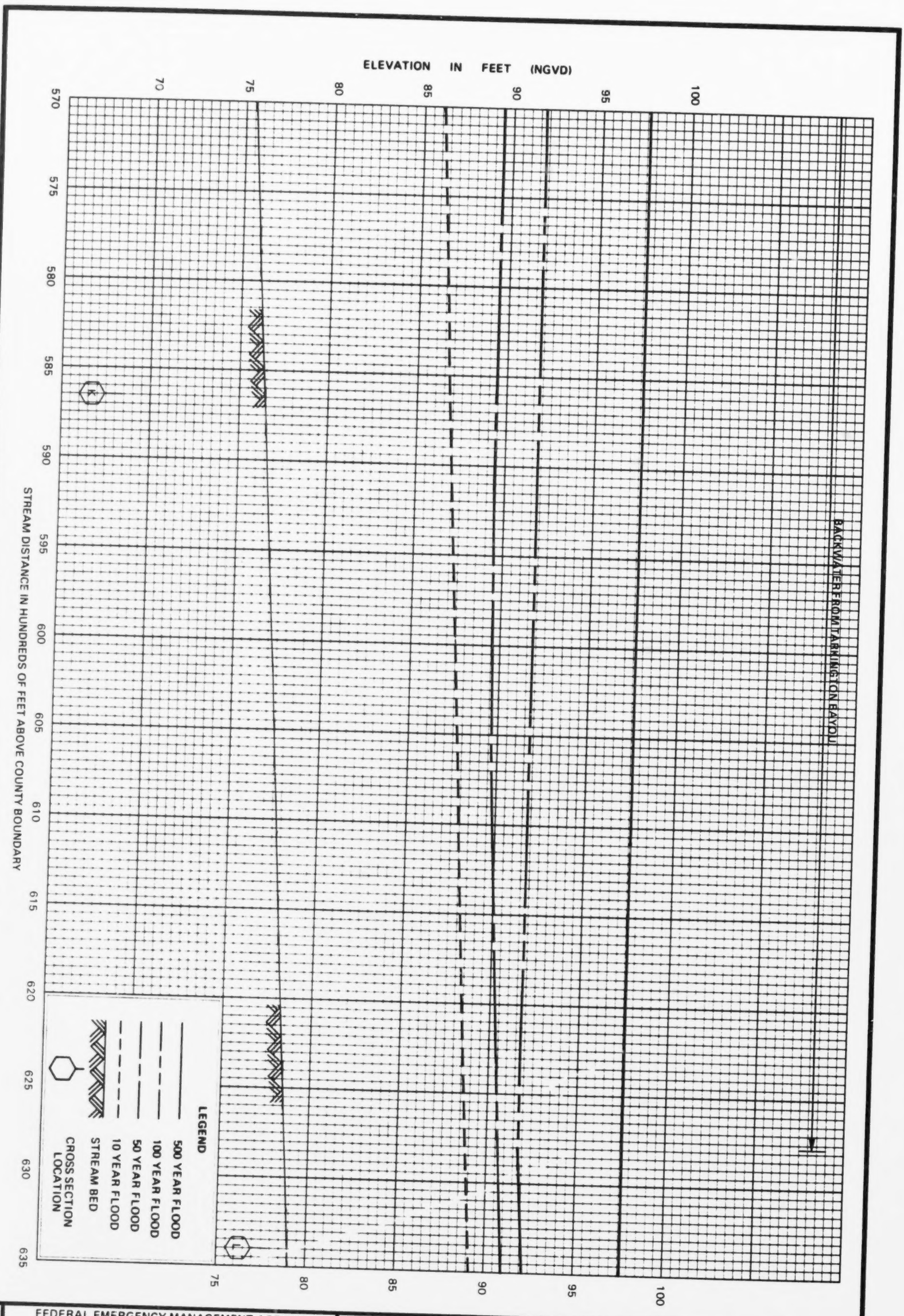
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU

37P



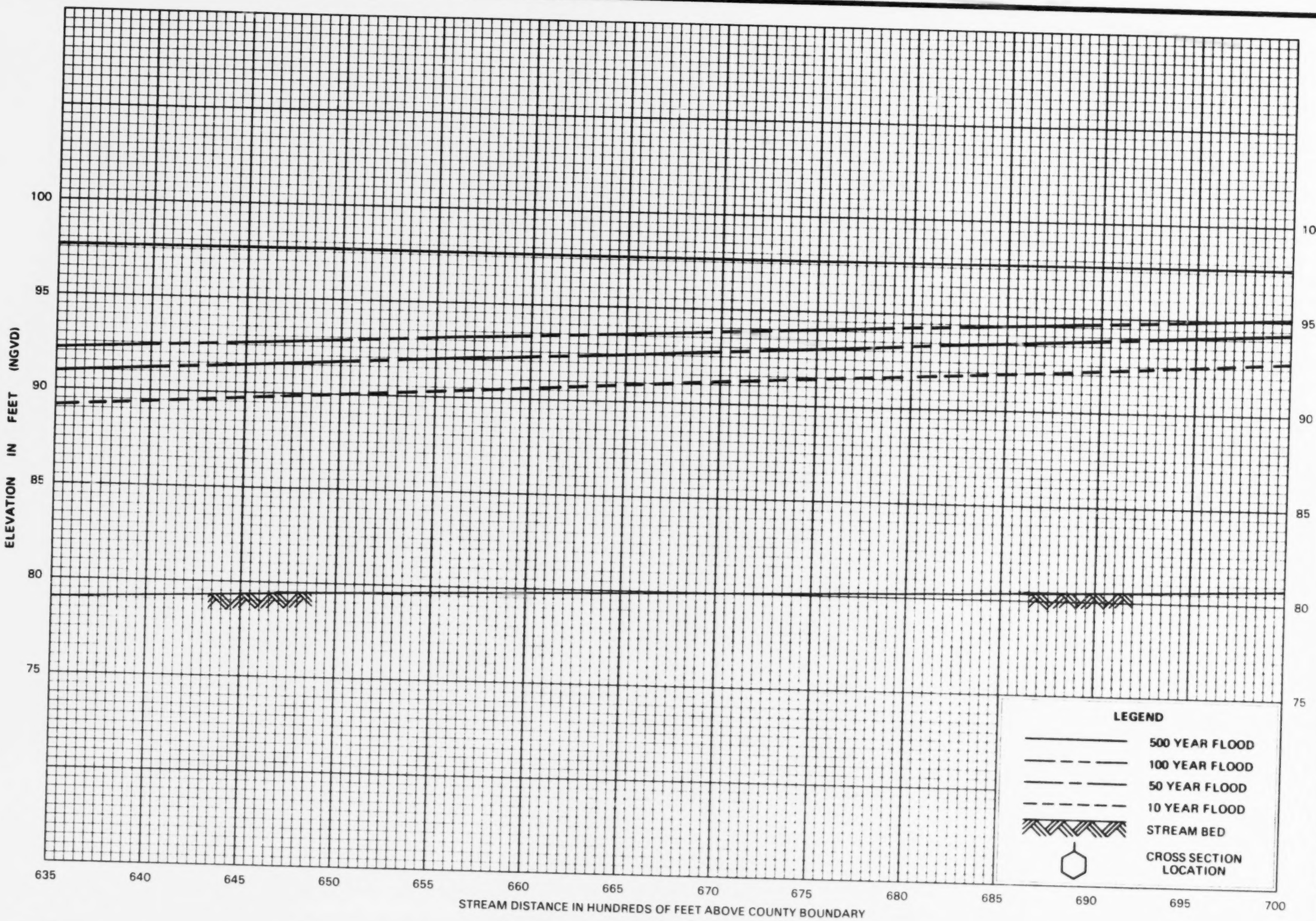
38P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU



FLOOD PROFILES

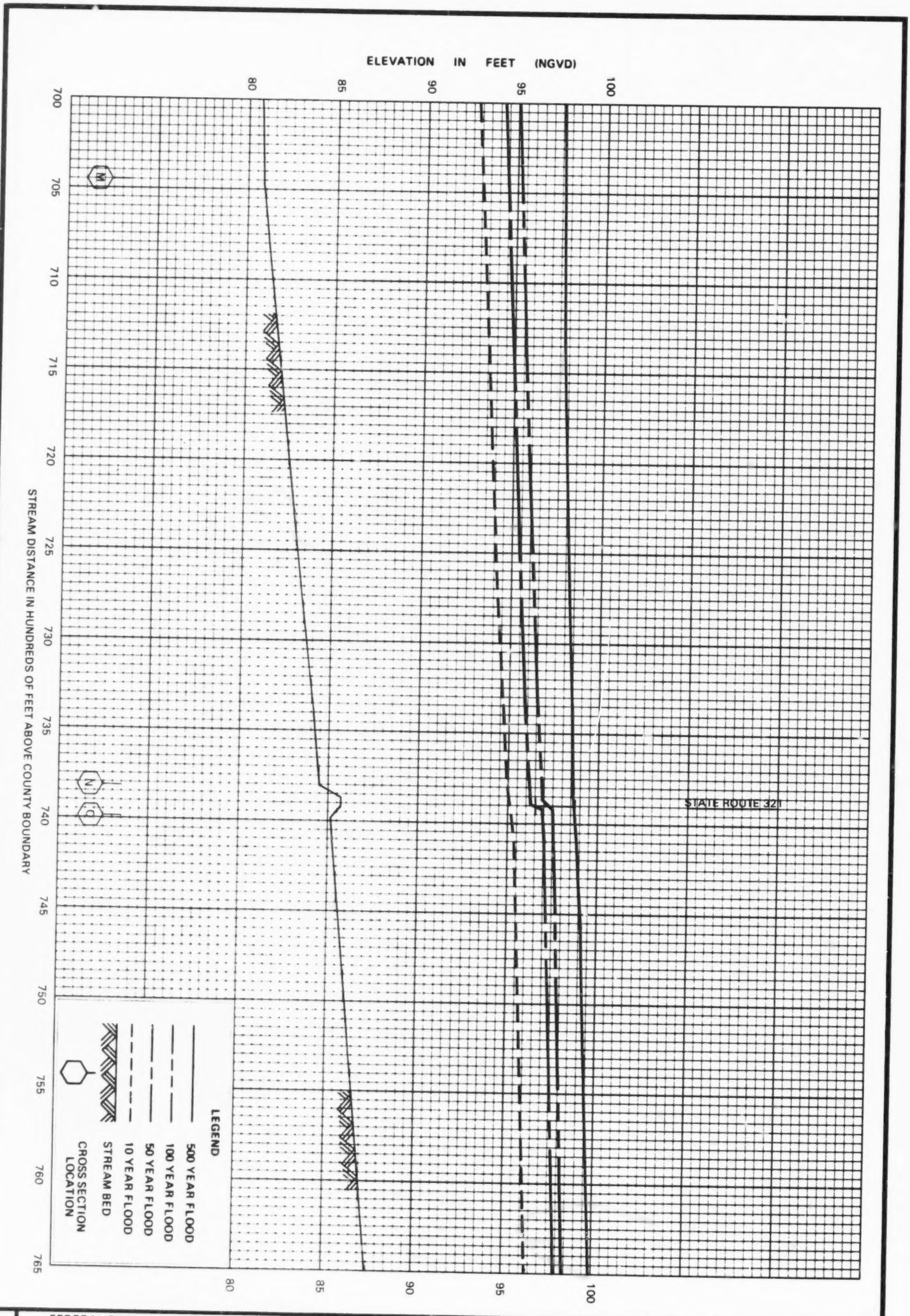
LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

39P



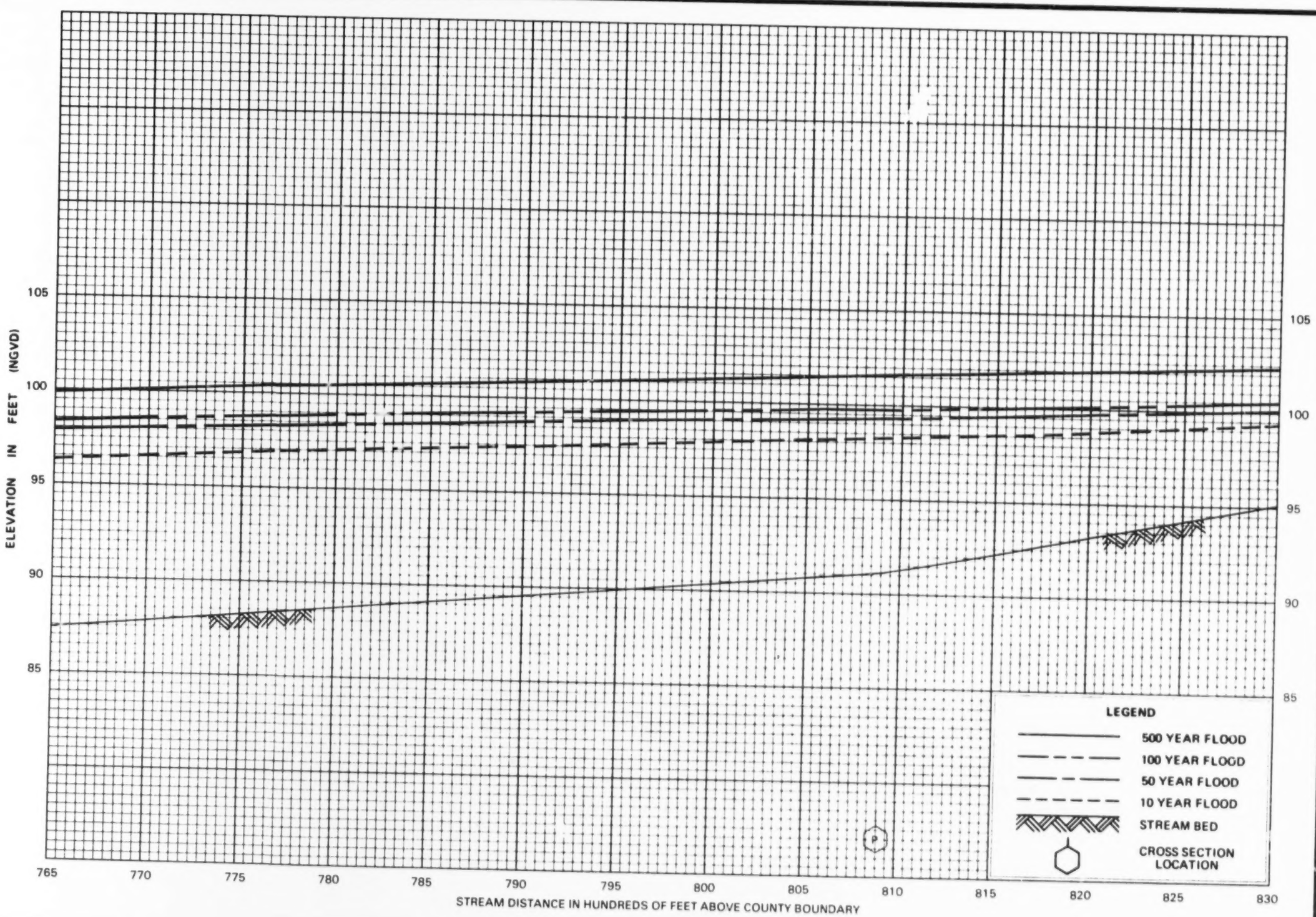
40P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU



FLOOD PROFILES

LUCE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

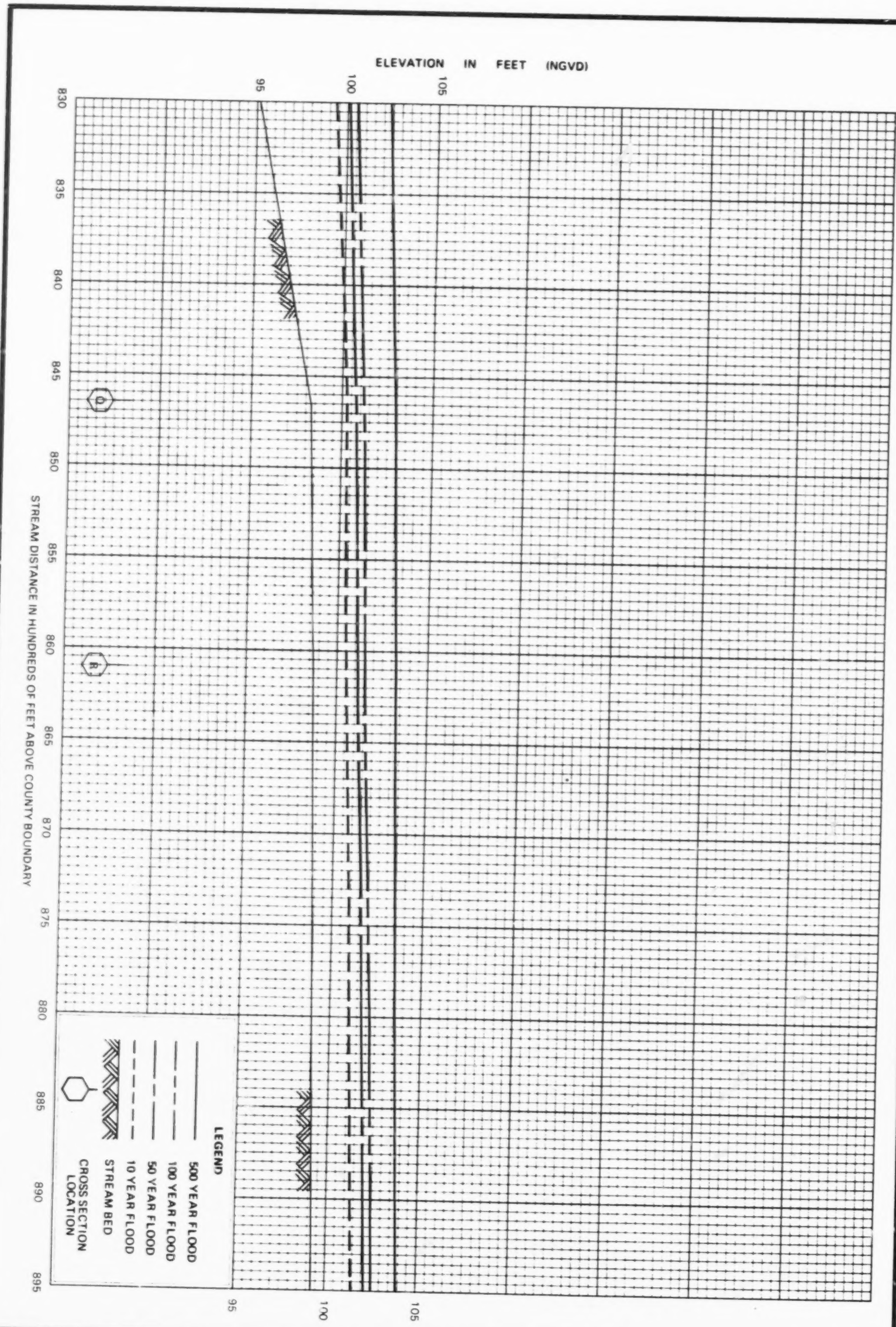
LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

41P

101

124486



42P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU

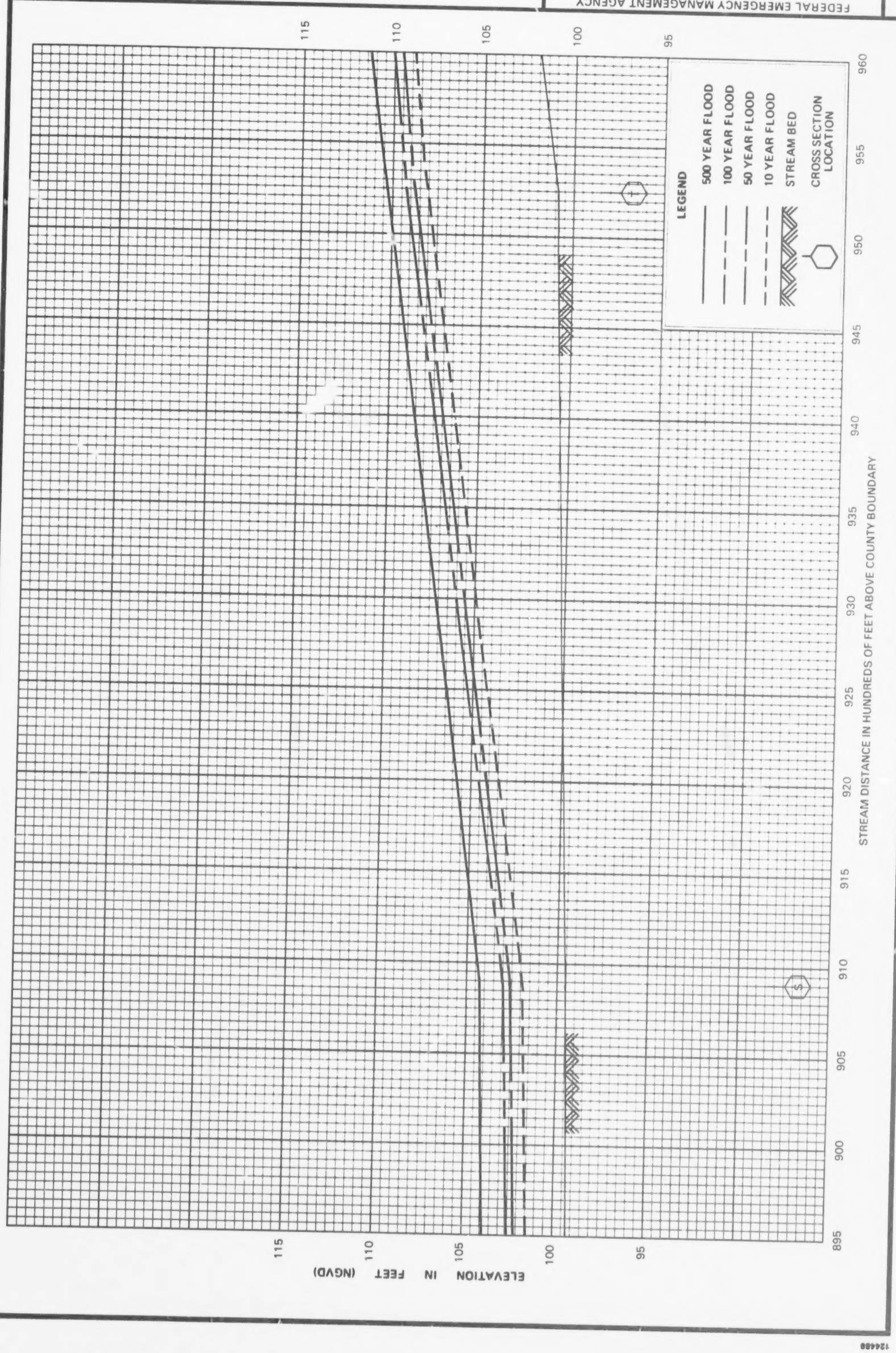
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

43P

FLOOD PROFILES

LUCE BAYOU



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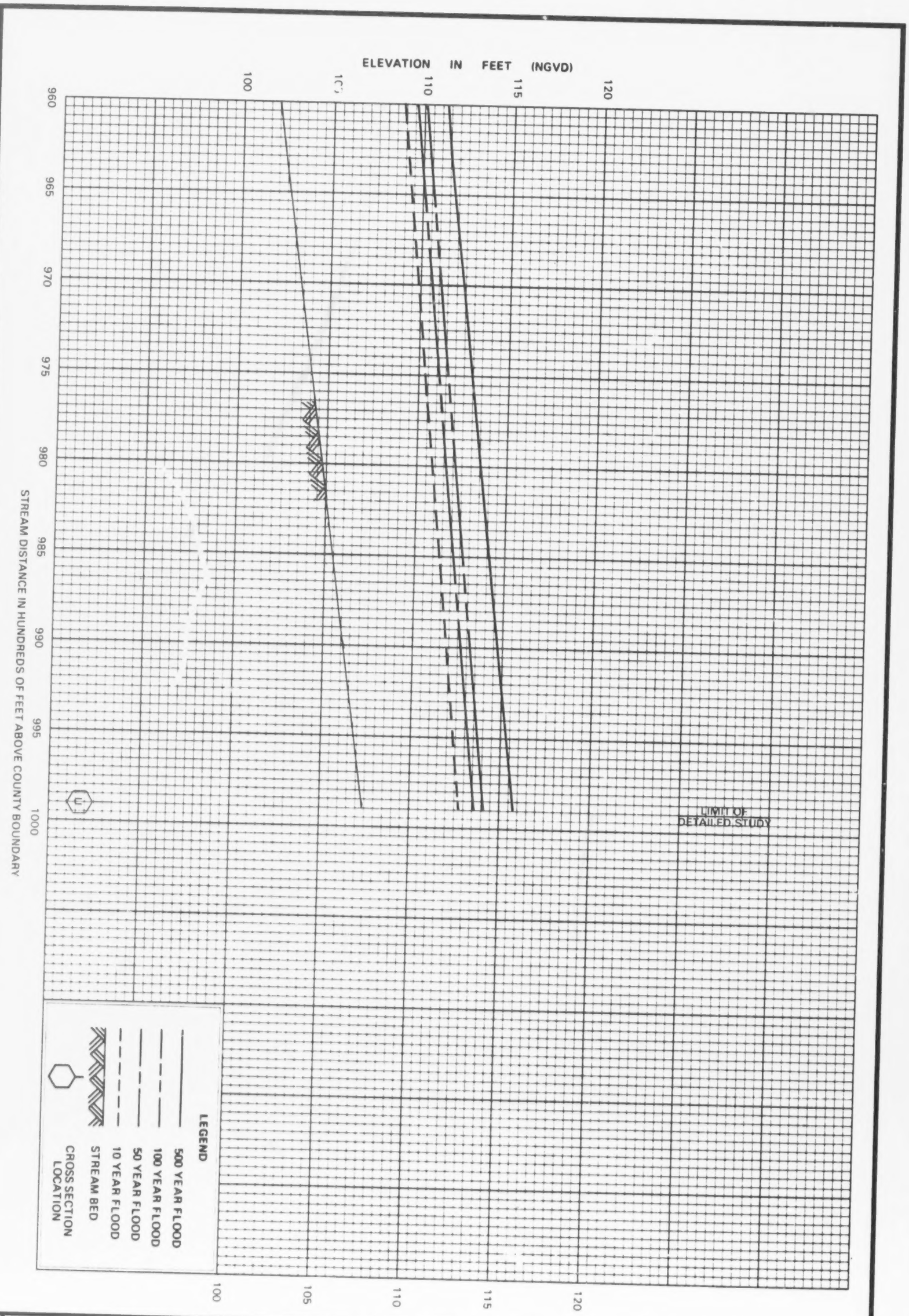


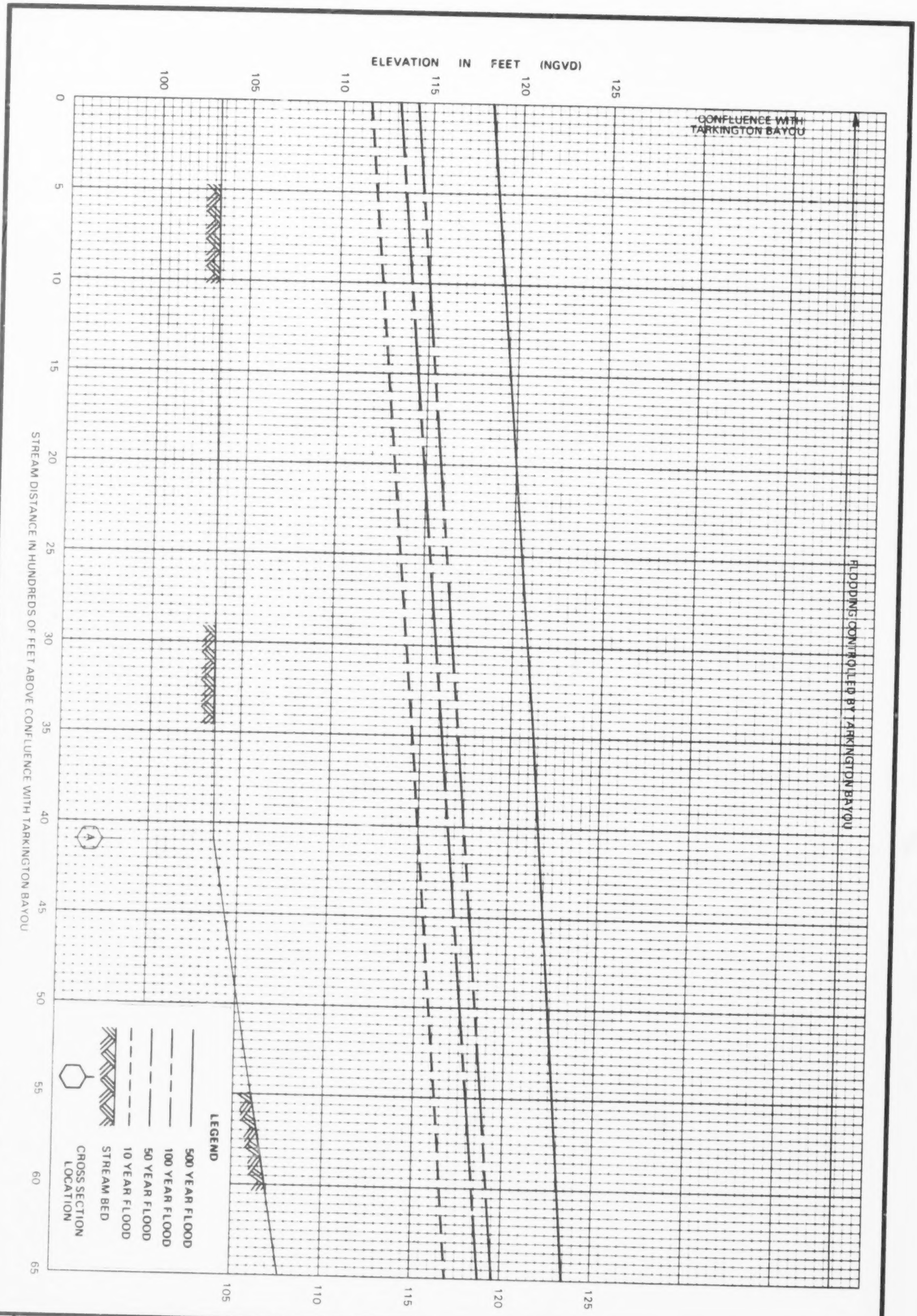
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

LUCE BAYOU

44P



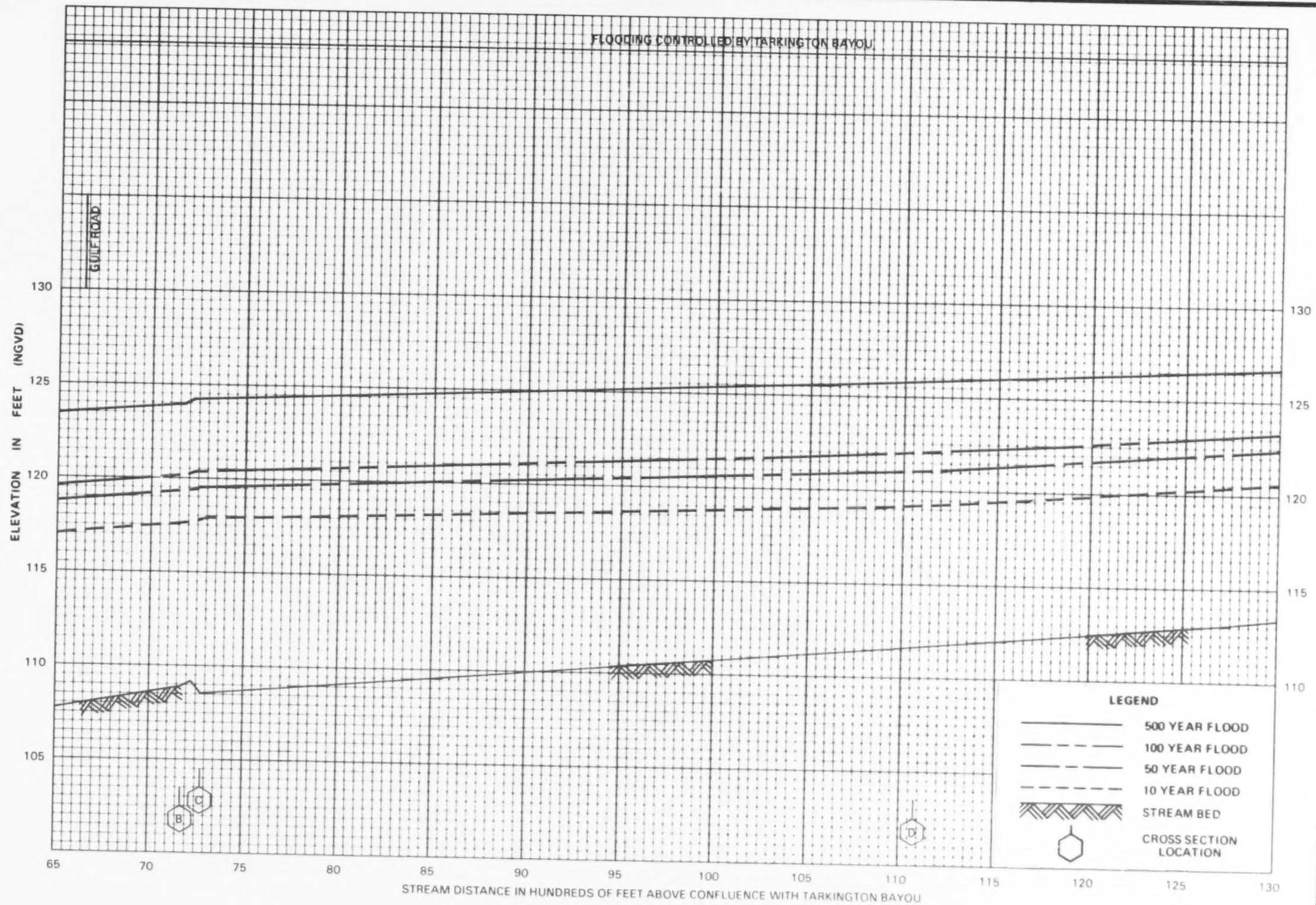
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH

45P



FLOOD PROFILES

MARSH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

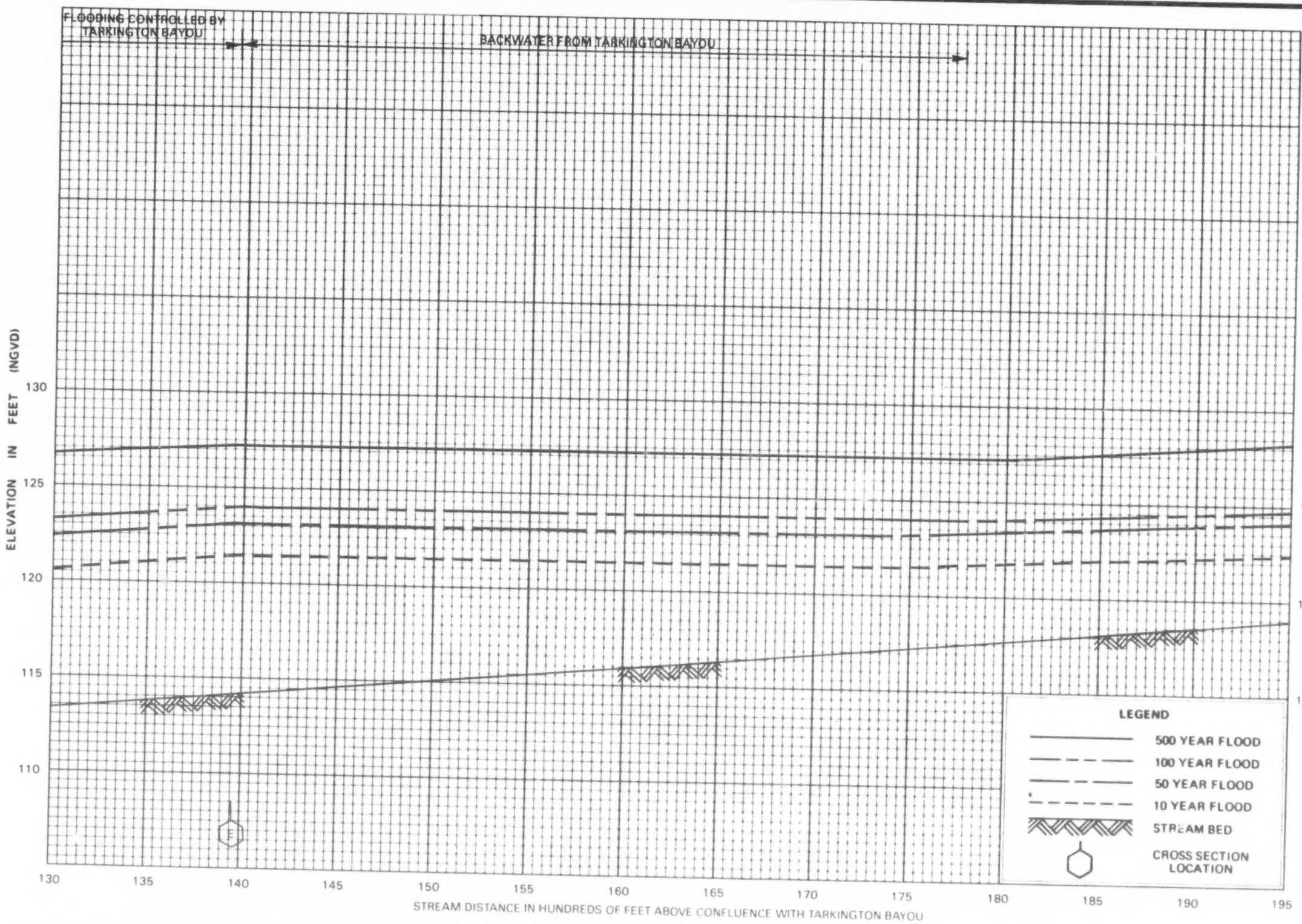
LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

46P

124480

106



FLOOD PROFILES

MARSH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

47P

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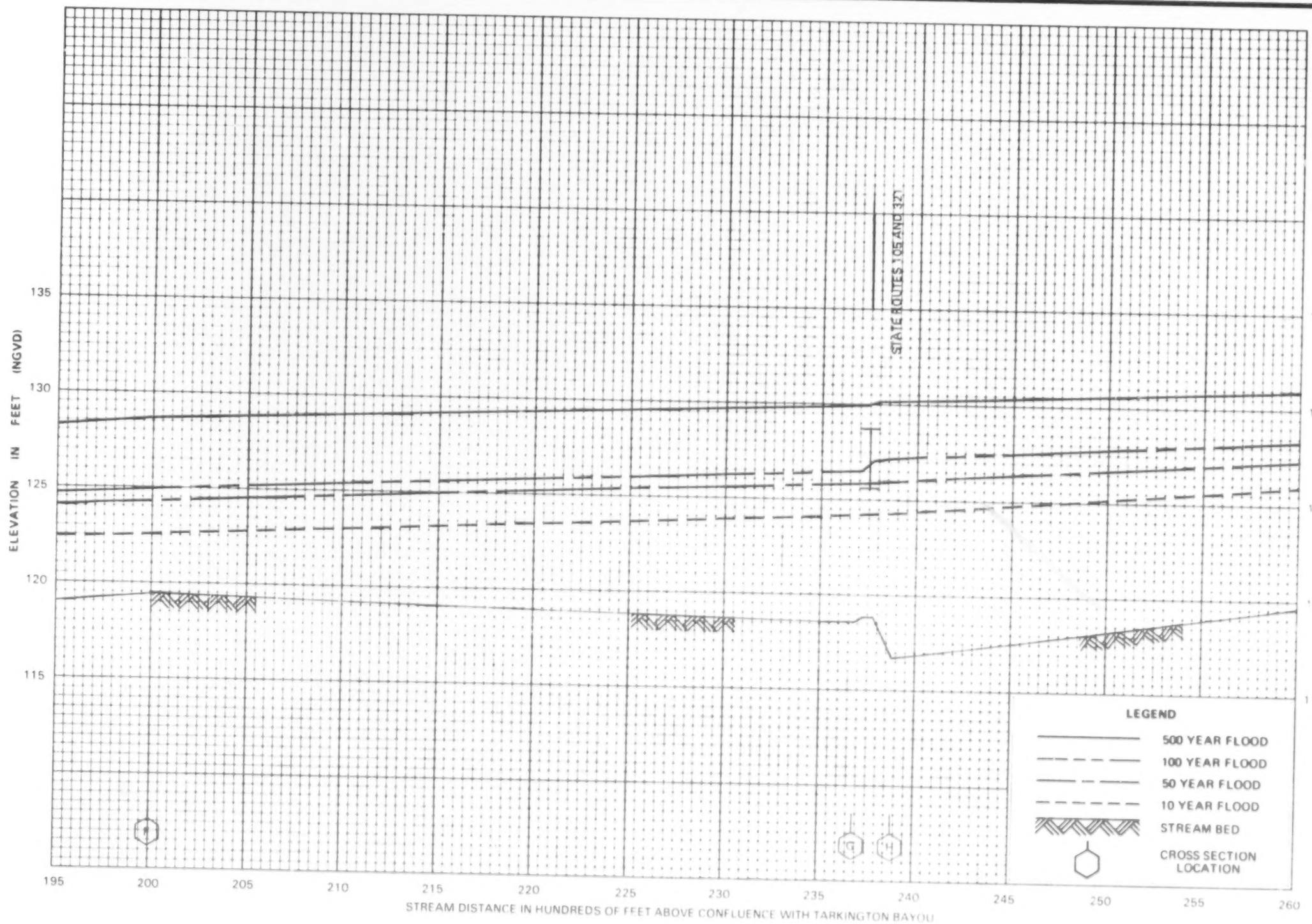


FLOOD PROFILES

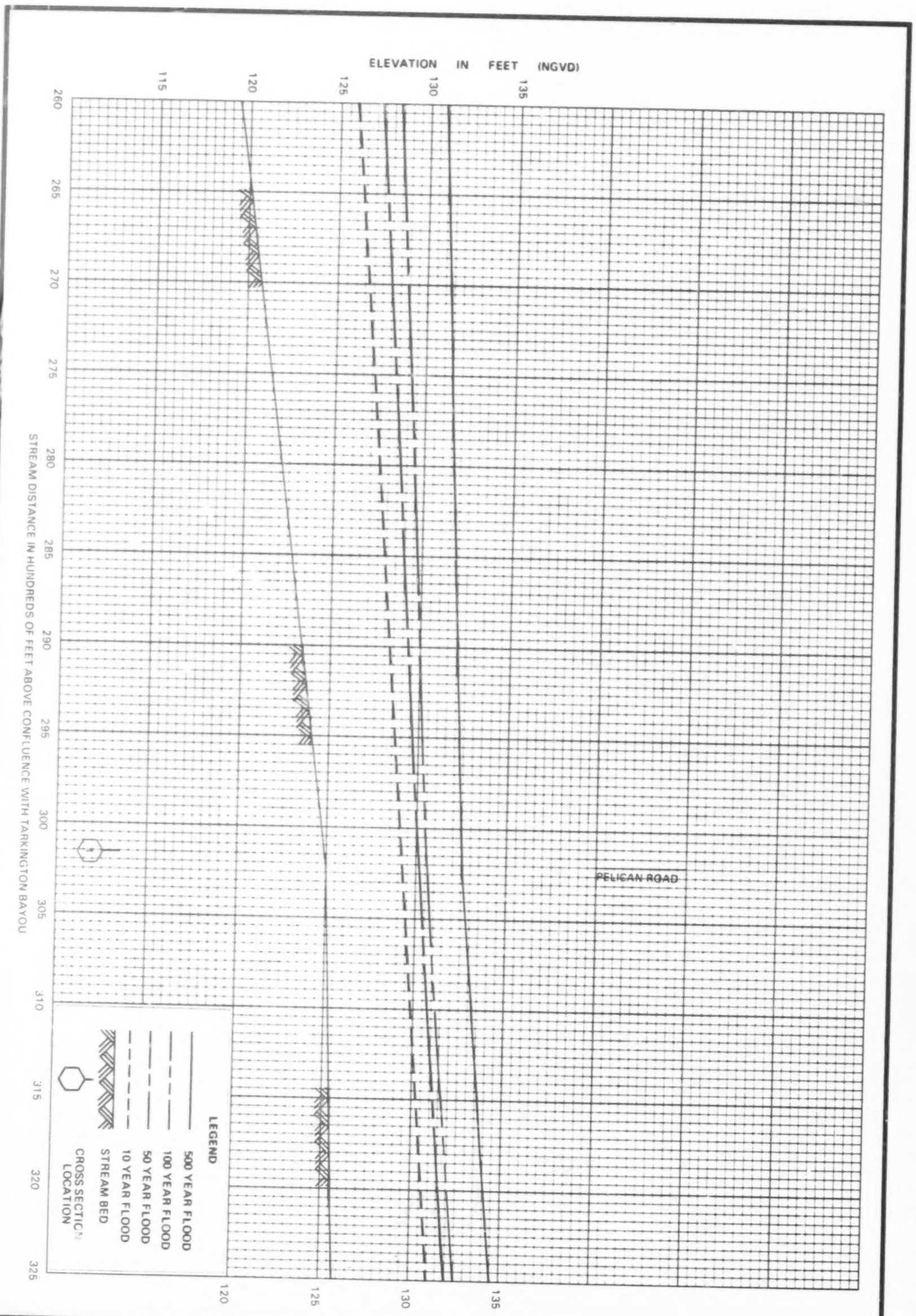
MARSH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

48P

124488



109

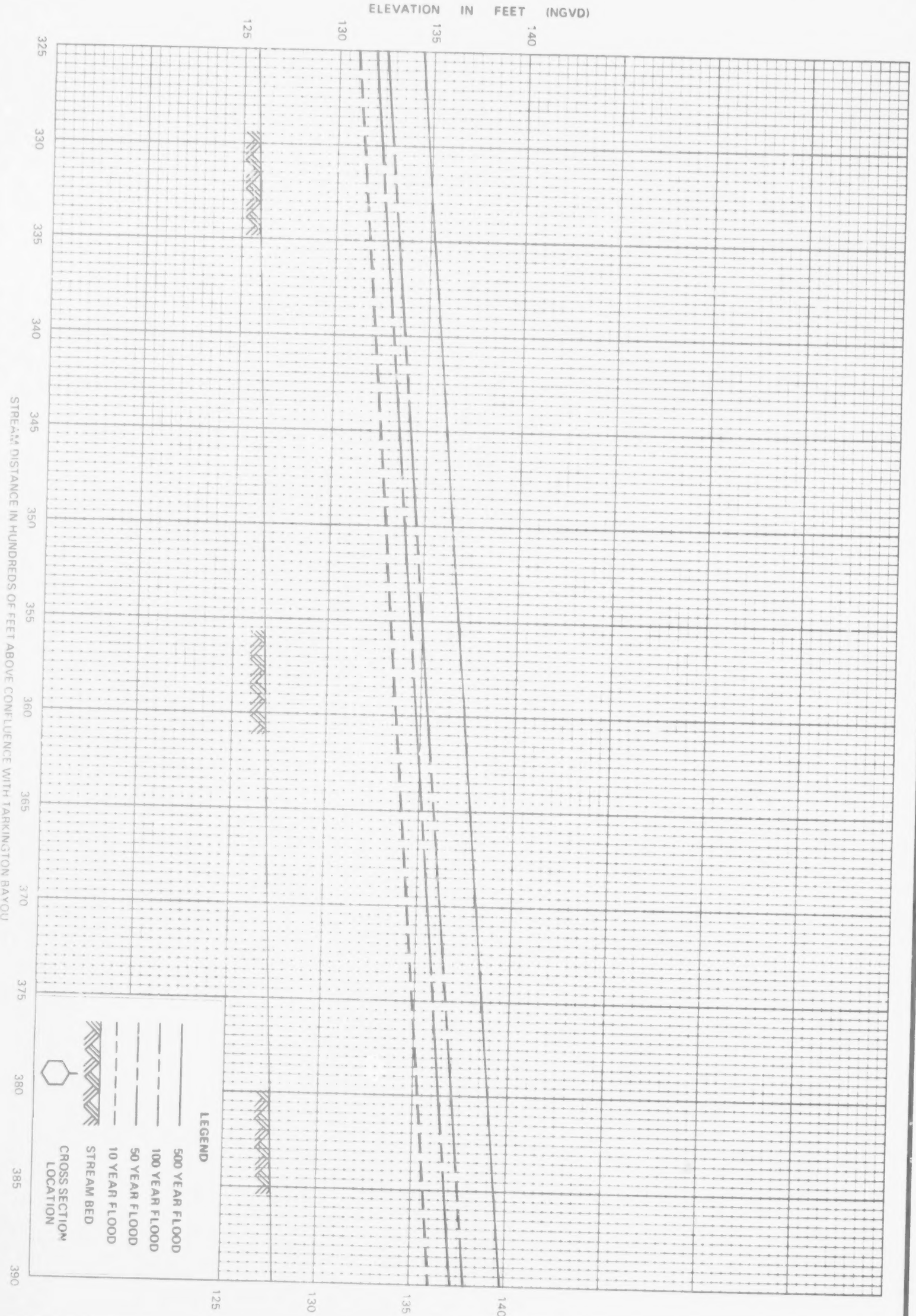
49P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH

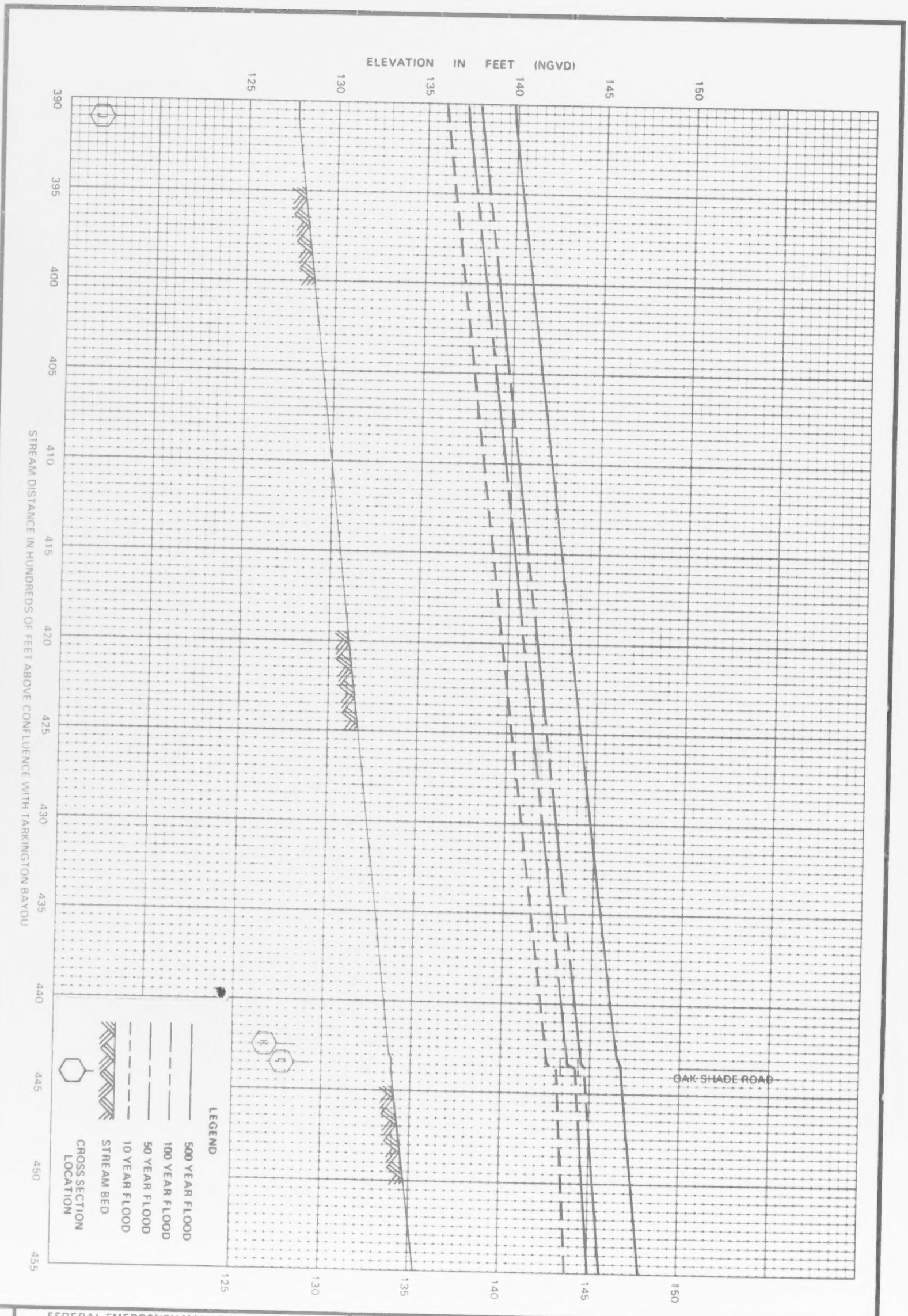


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH



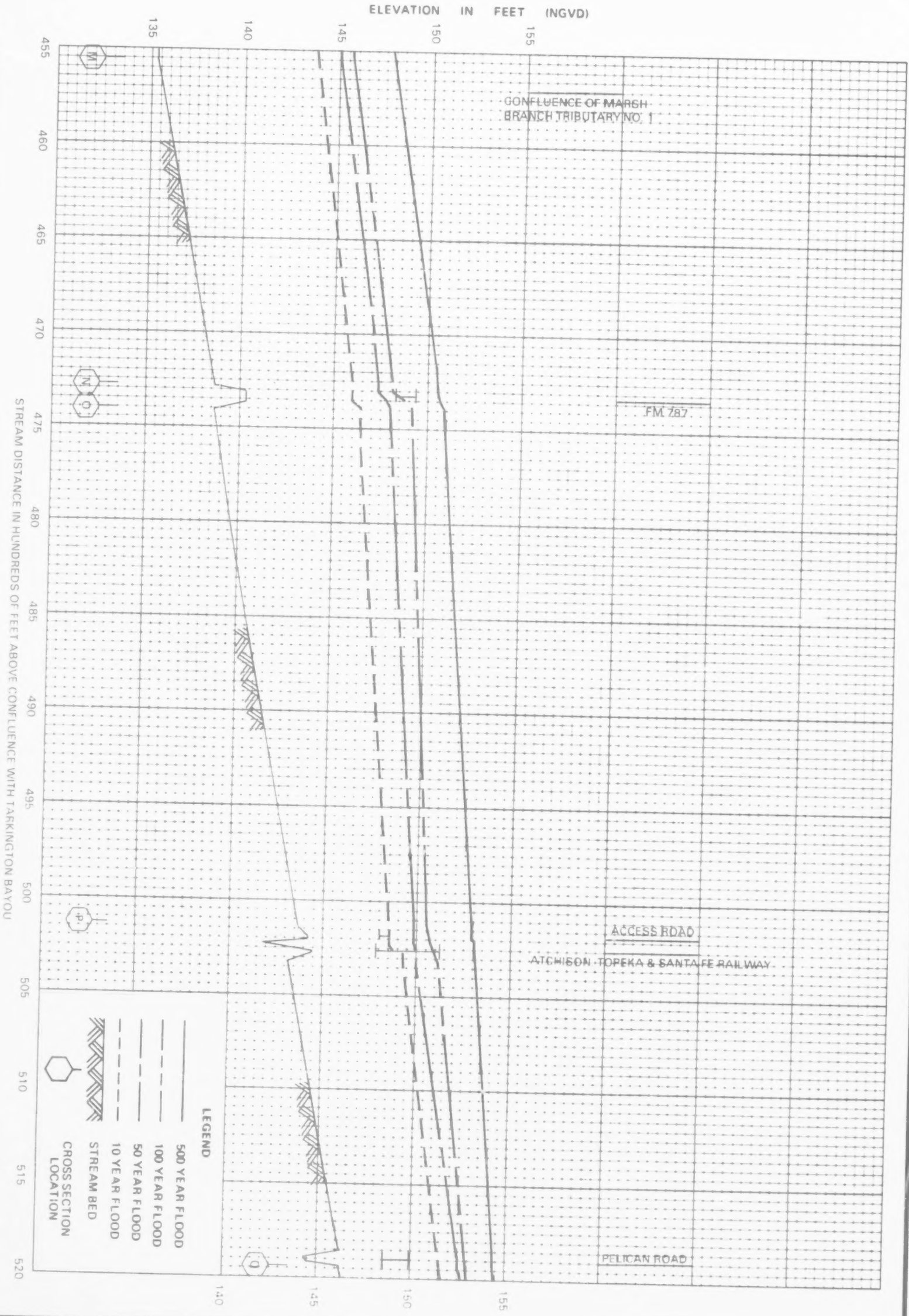
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH

51P



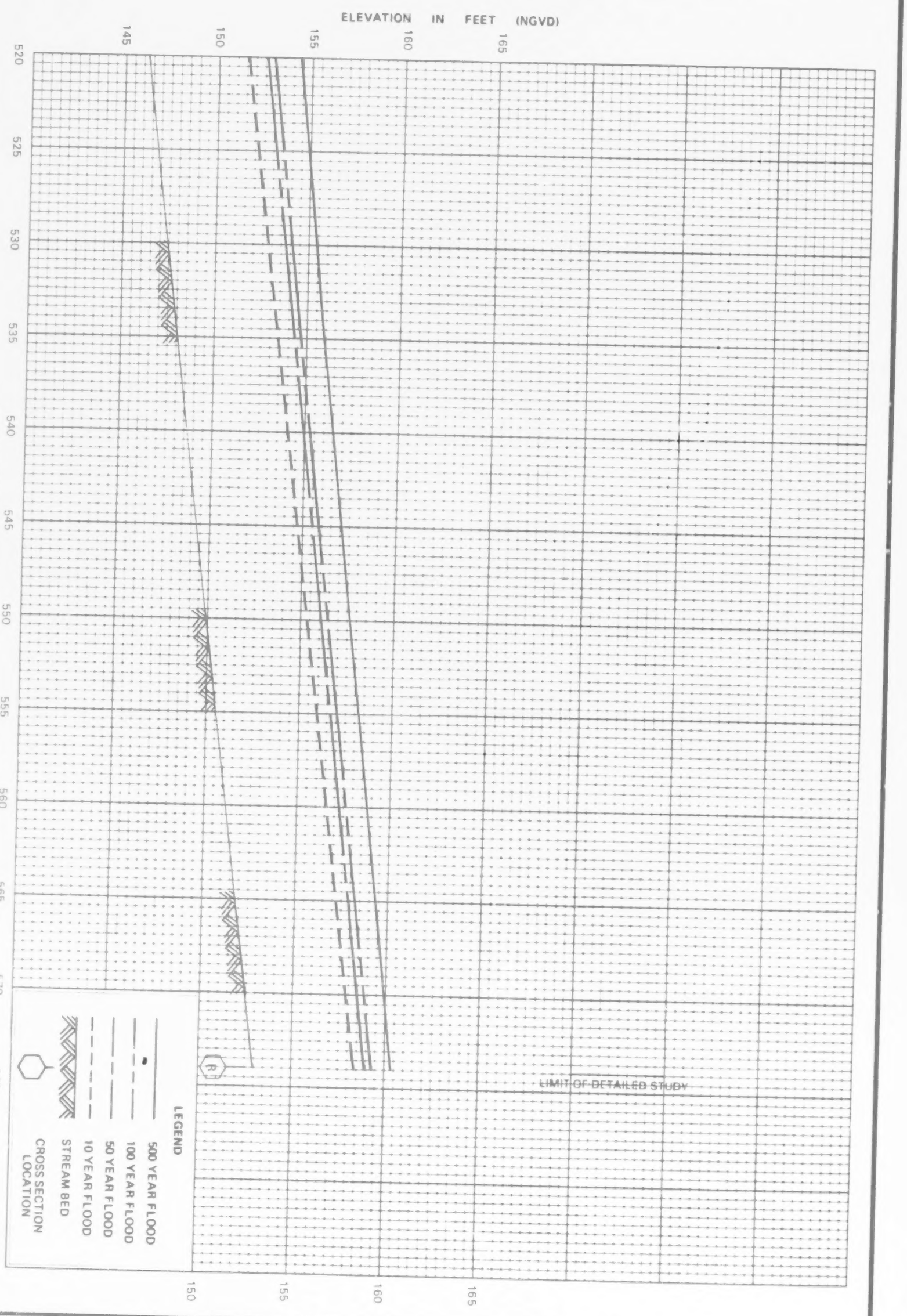
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH

52P



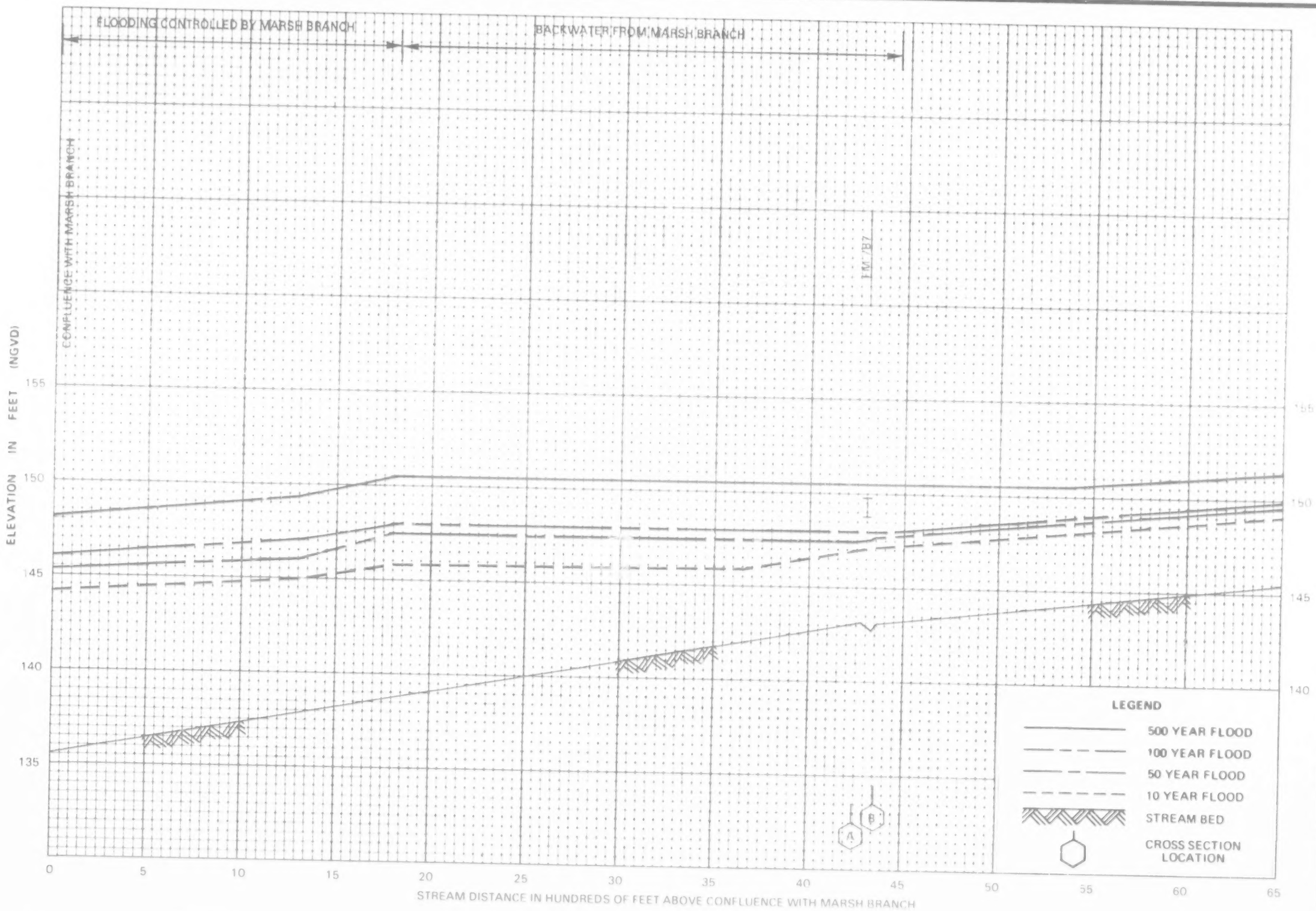
53P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH



FLOOD PROFILES

MARSH BRANCH TRIBUTARY NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

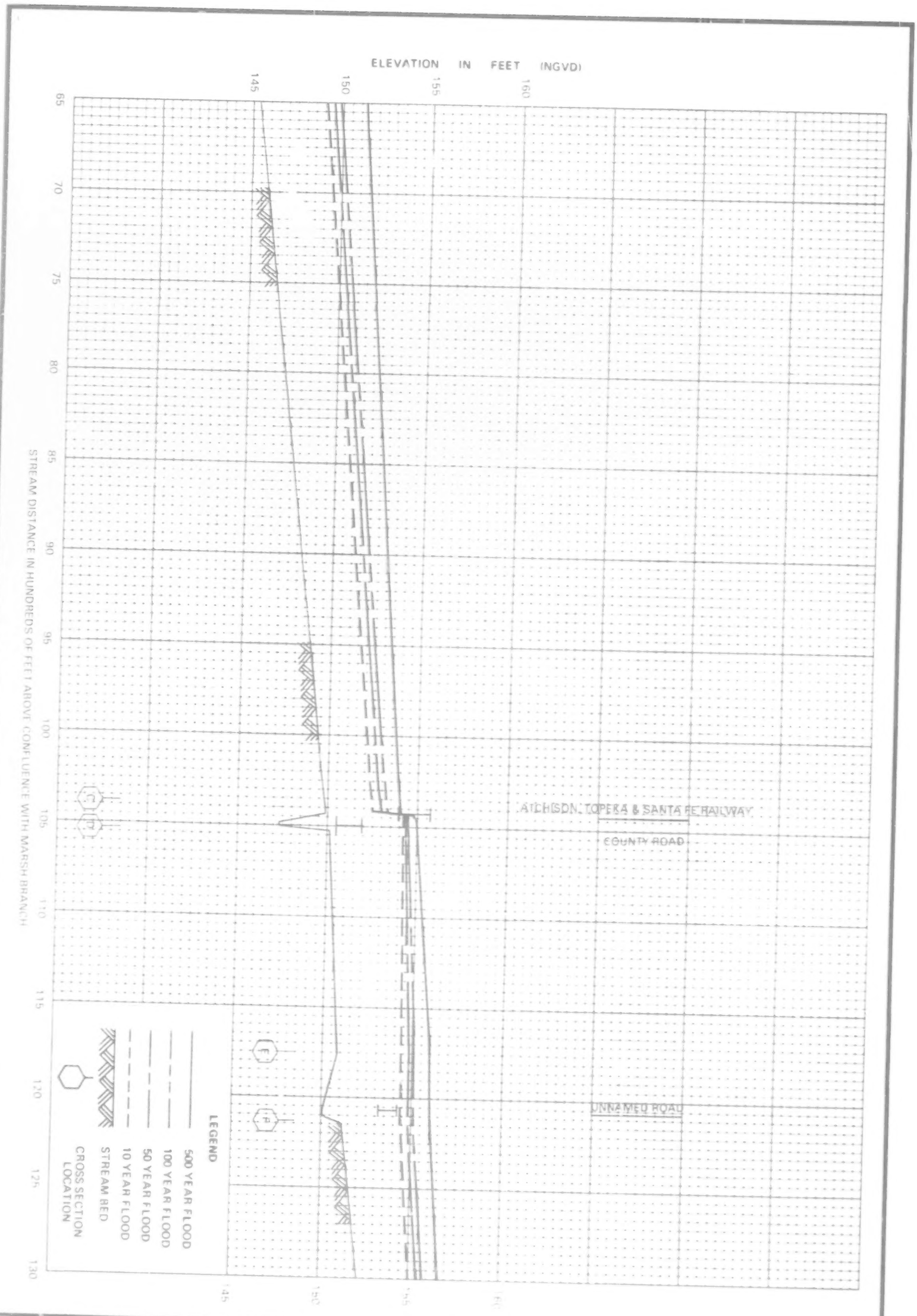
LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

54P

124498

114



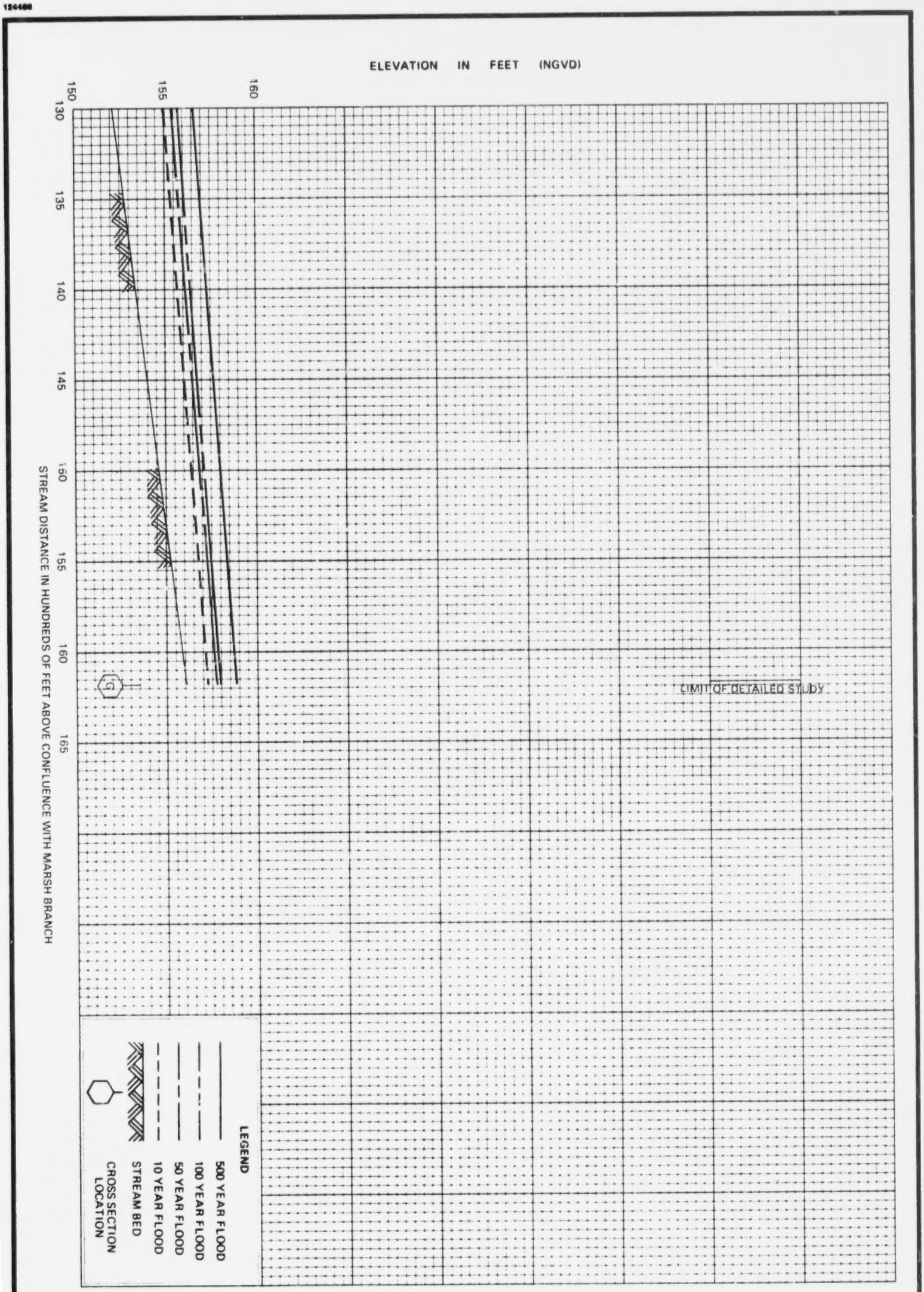
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH TRIBUTARY NO. 1

55P

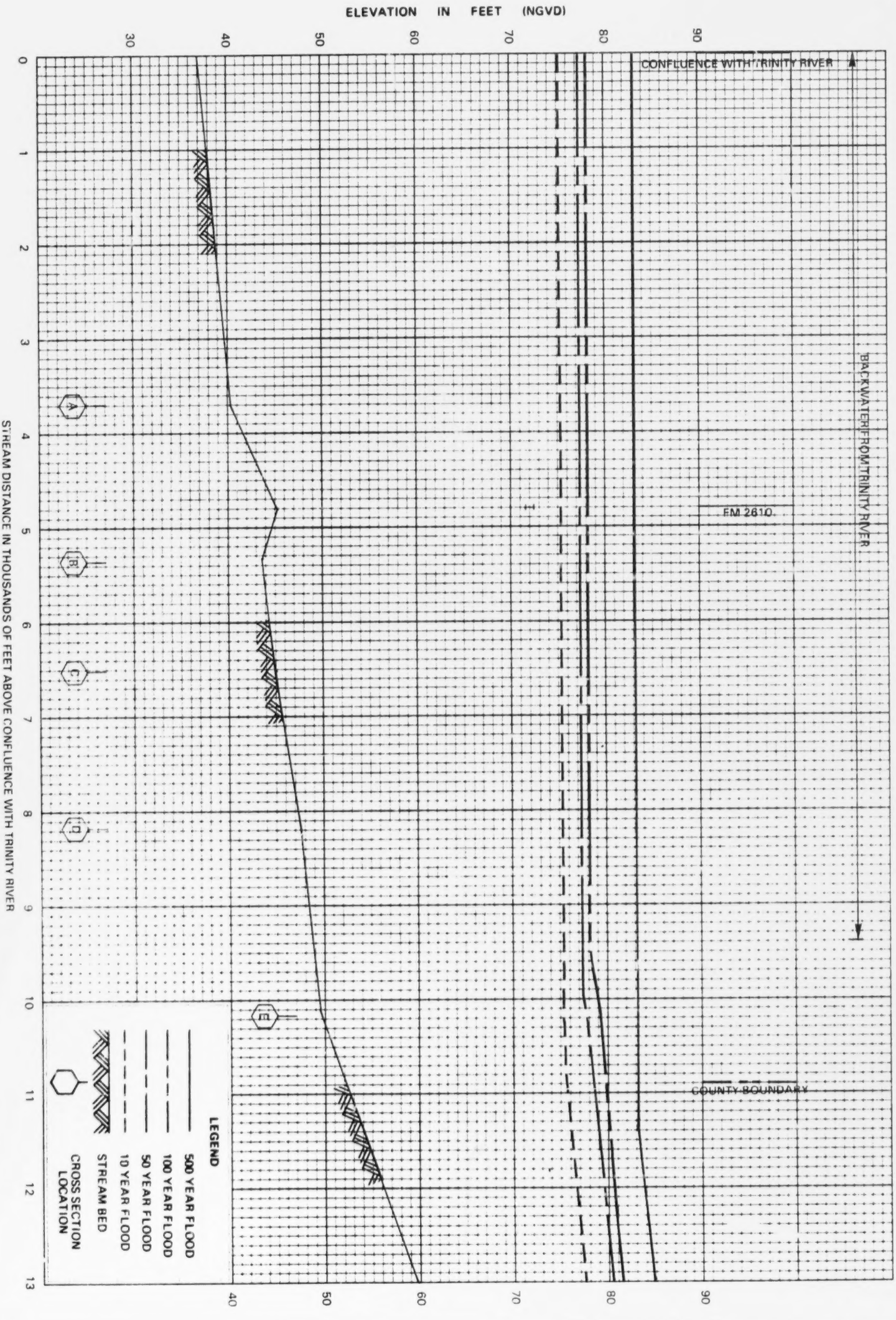


FEDERAL EMERGENCY MANAGEMENT AGENCY

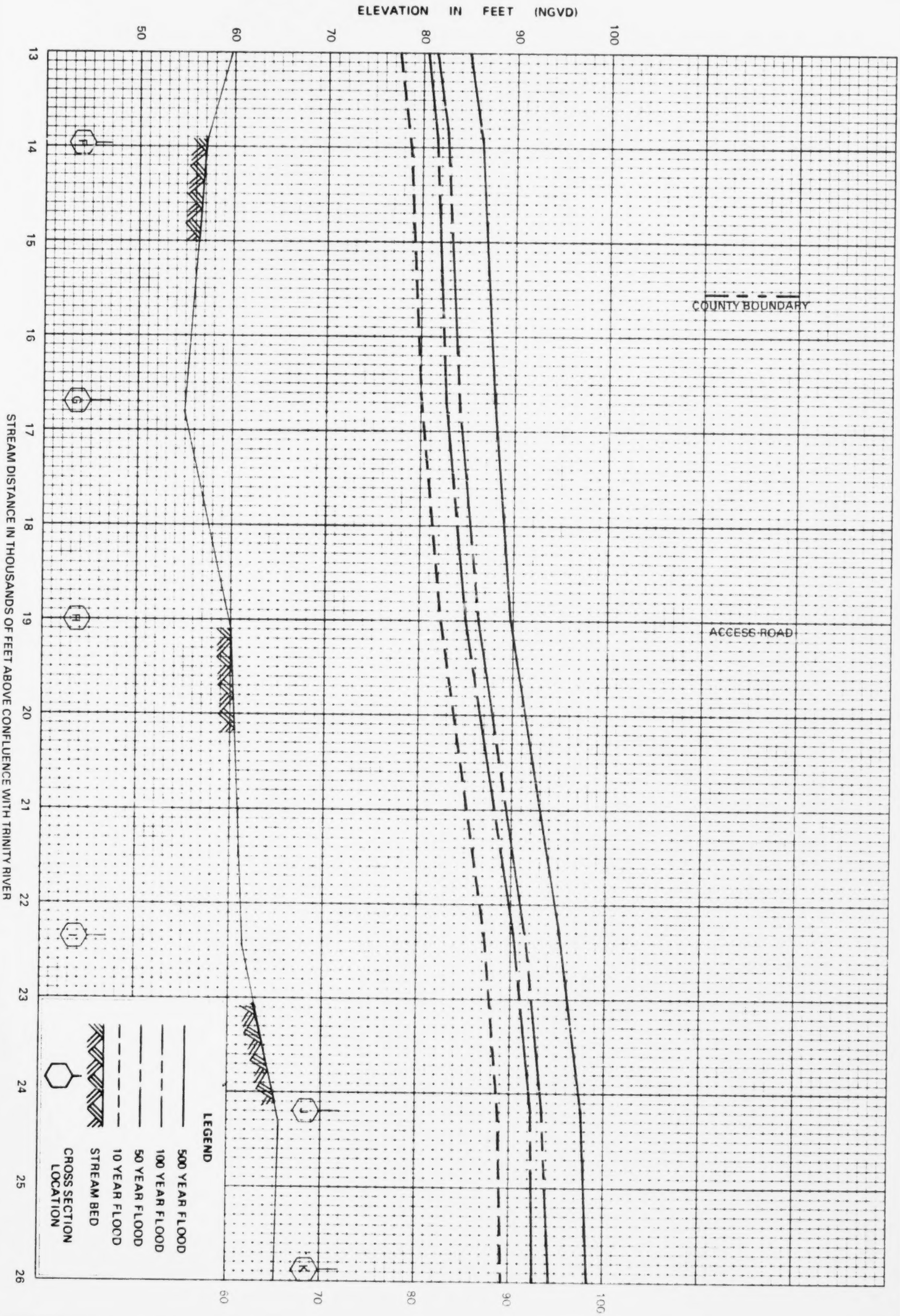
LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MARSH BRANCH TRIBUTARY NO. 1



57P	FEDERAL EMERGENCY MANAGEMENT AGENCY **LIBERTY COUNTY, TX** (UNINCORPORATED AREAS)	**FLOOD PROFILES** **MENARD CREEK**



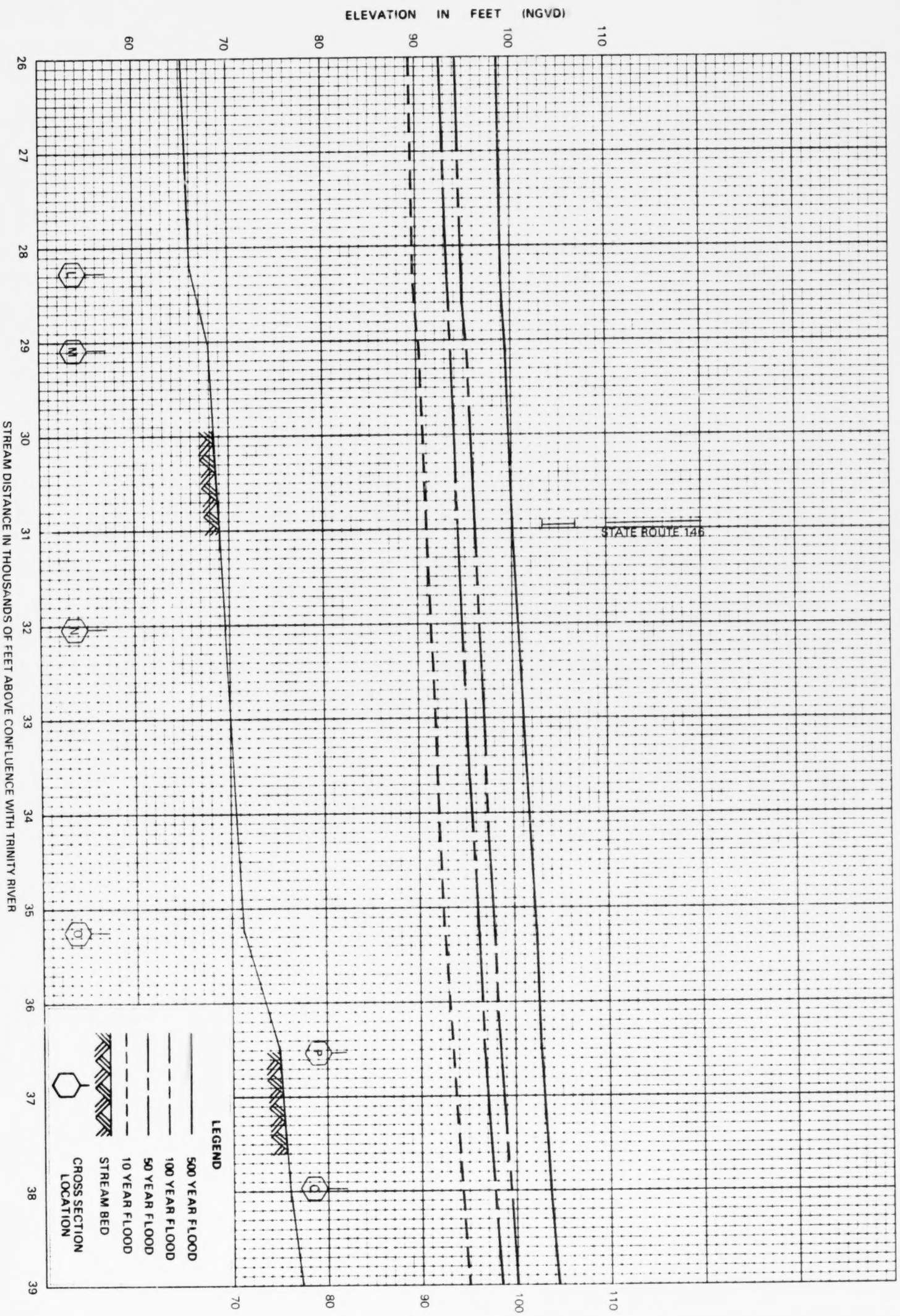
58P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MENARD CREEK



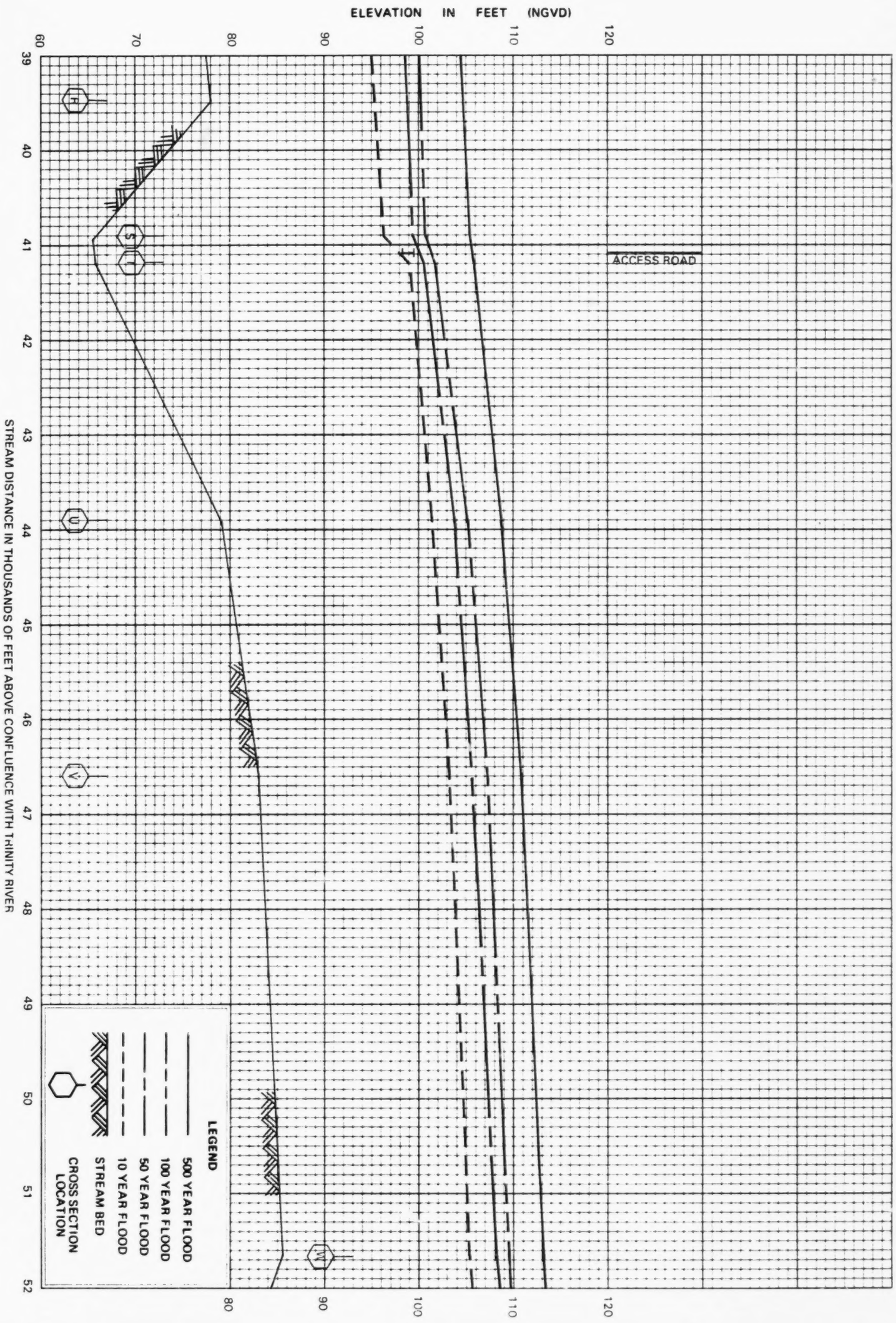
59P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MENARD CREEK



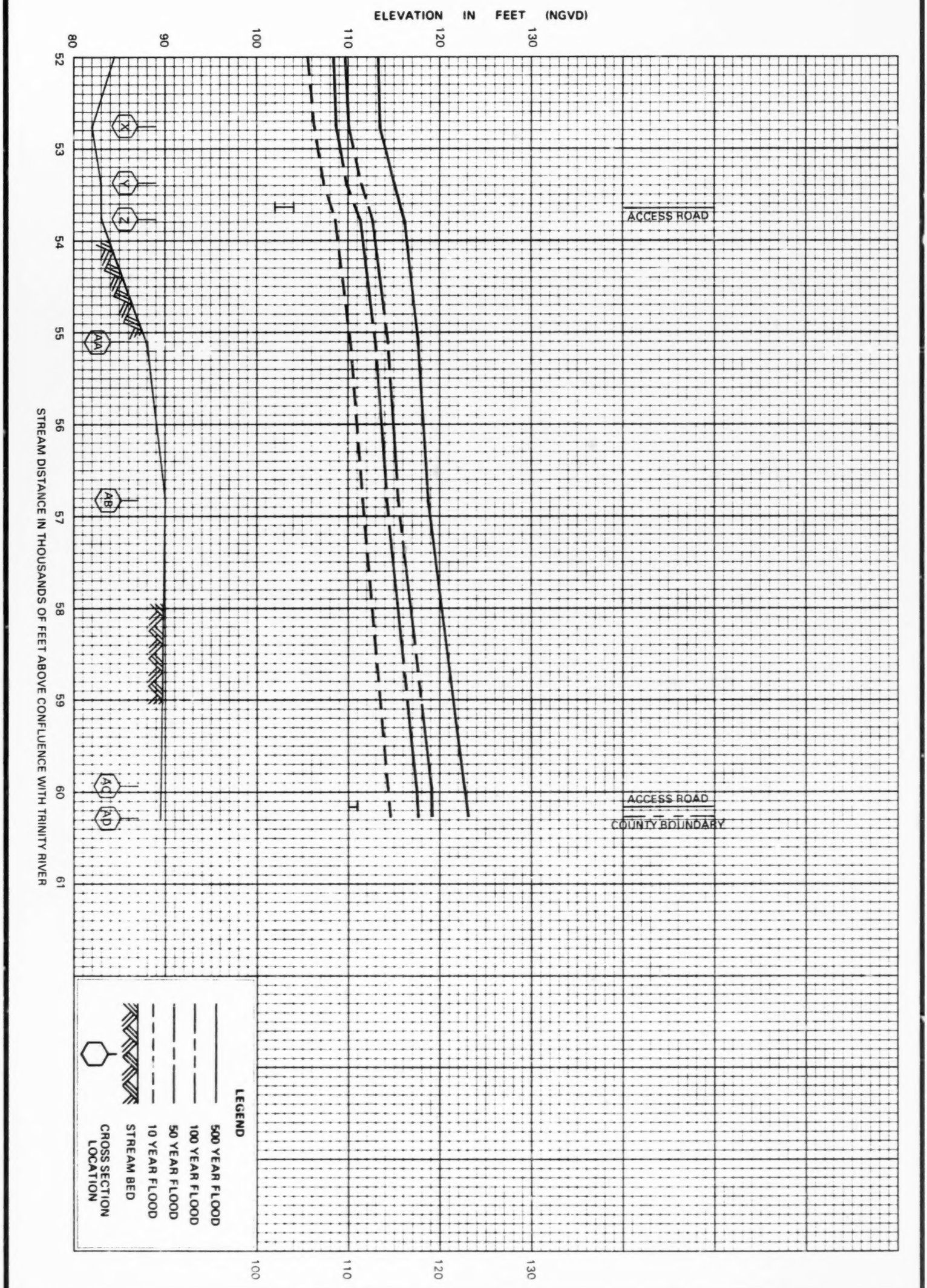
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MENARD CREEK

60P



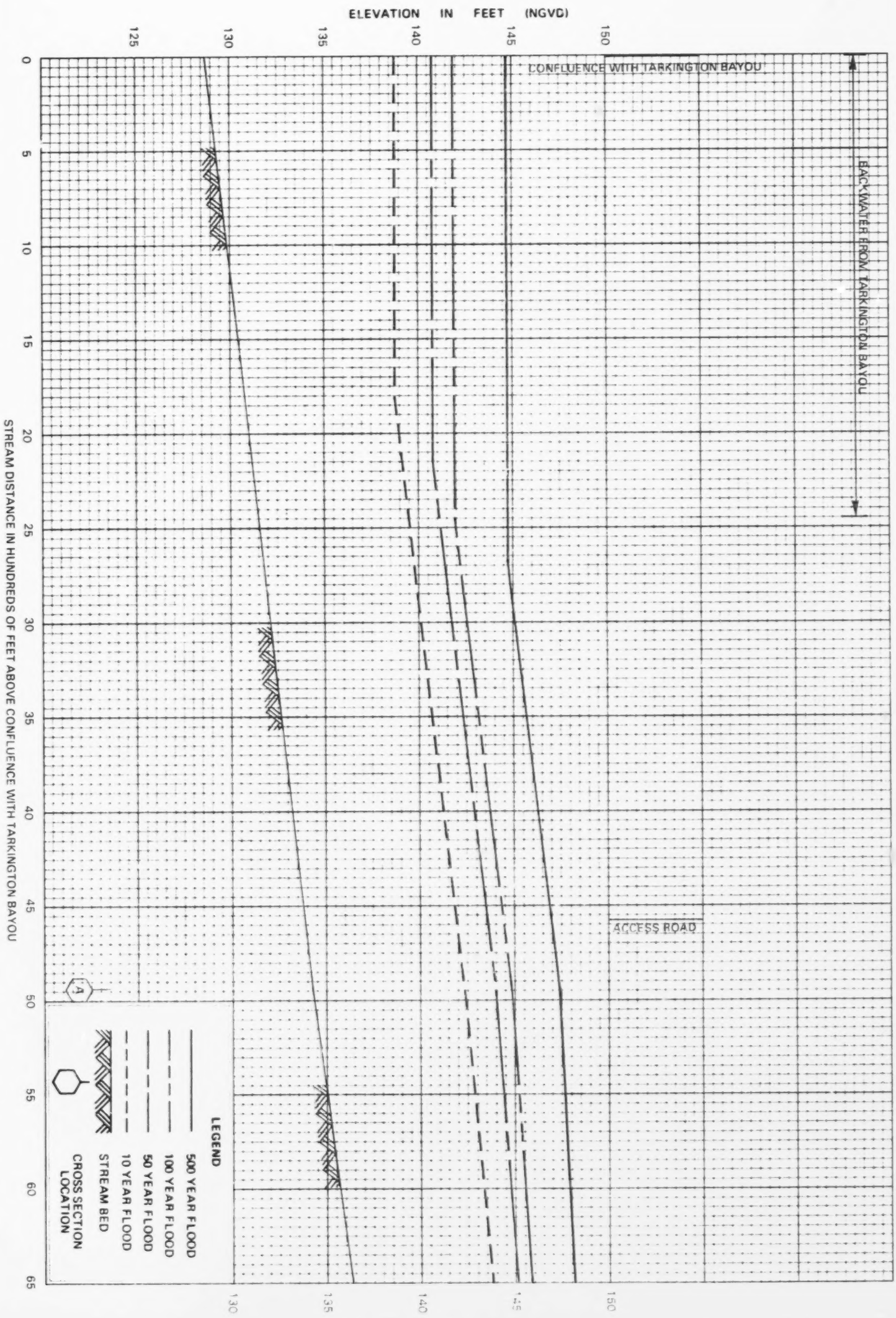
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

MENARD CREEK

61P



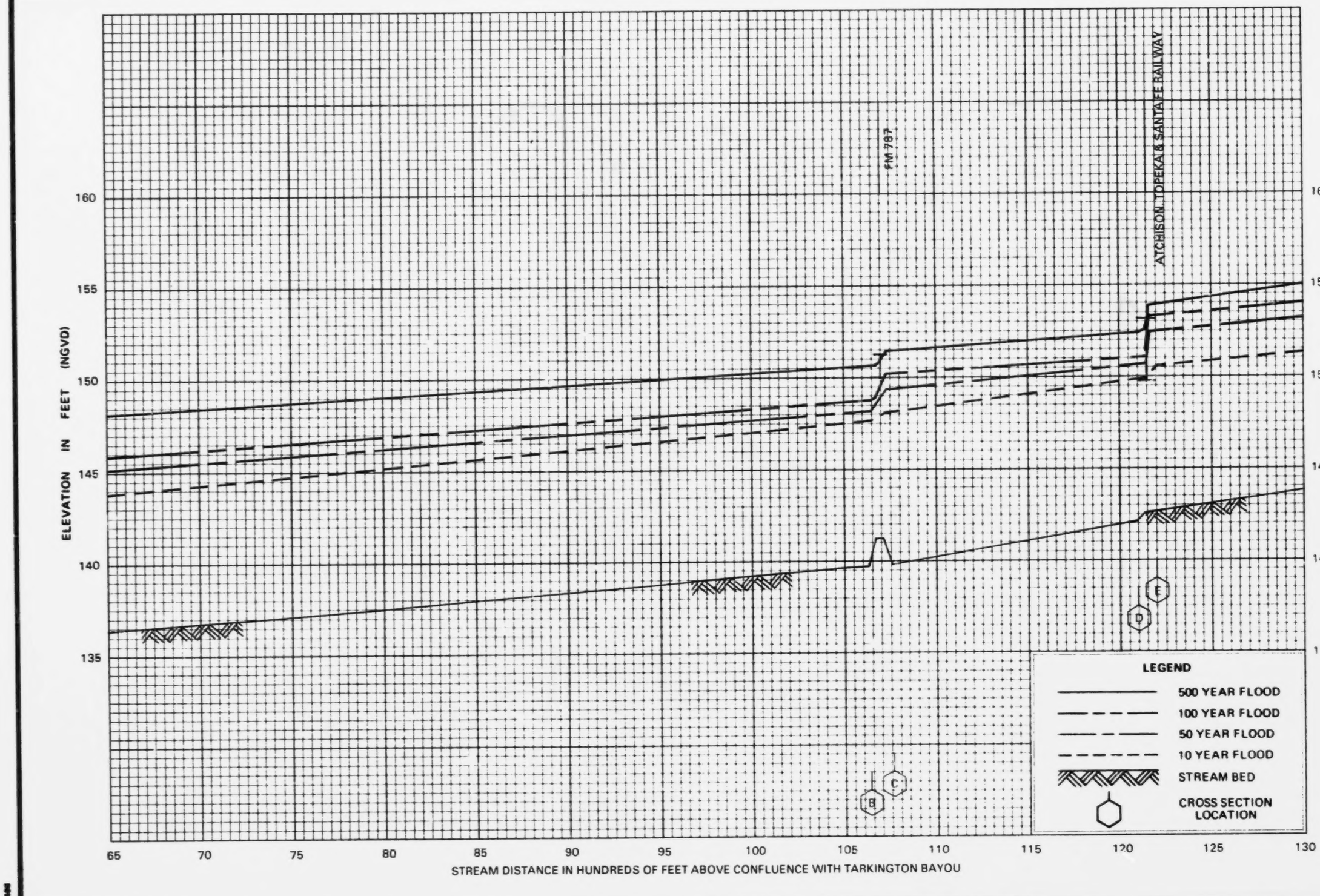
62P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

REESE BAYOU



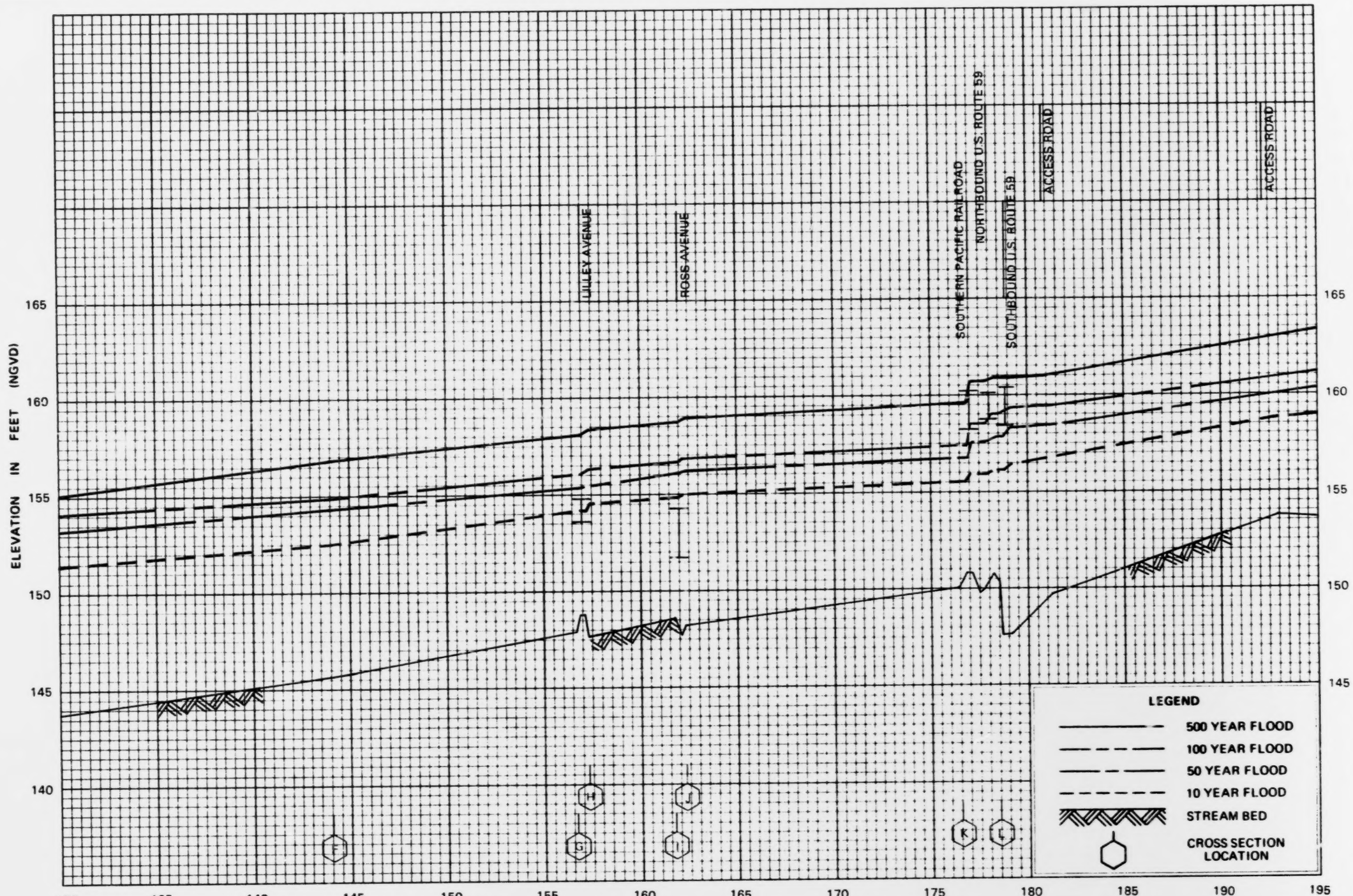
FLOOD PROFILES

REESE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

63P



FLOOD PROFILES

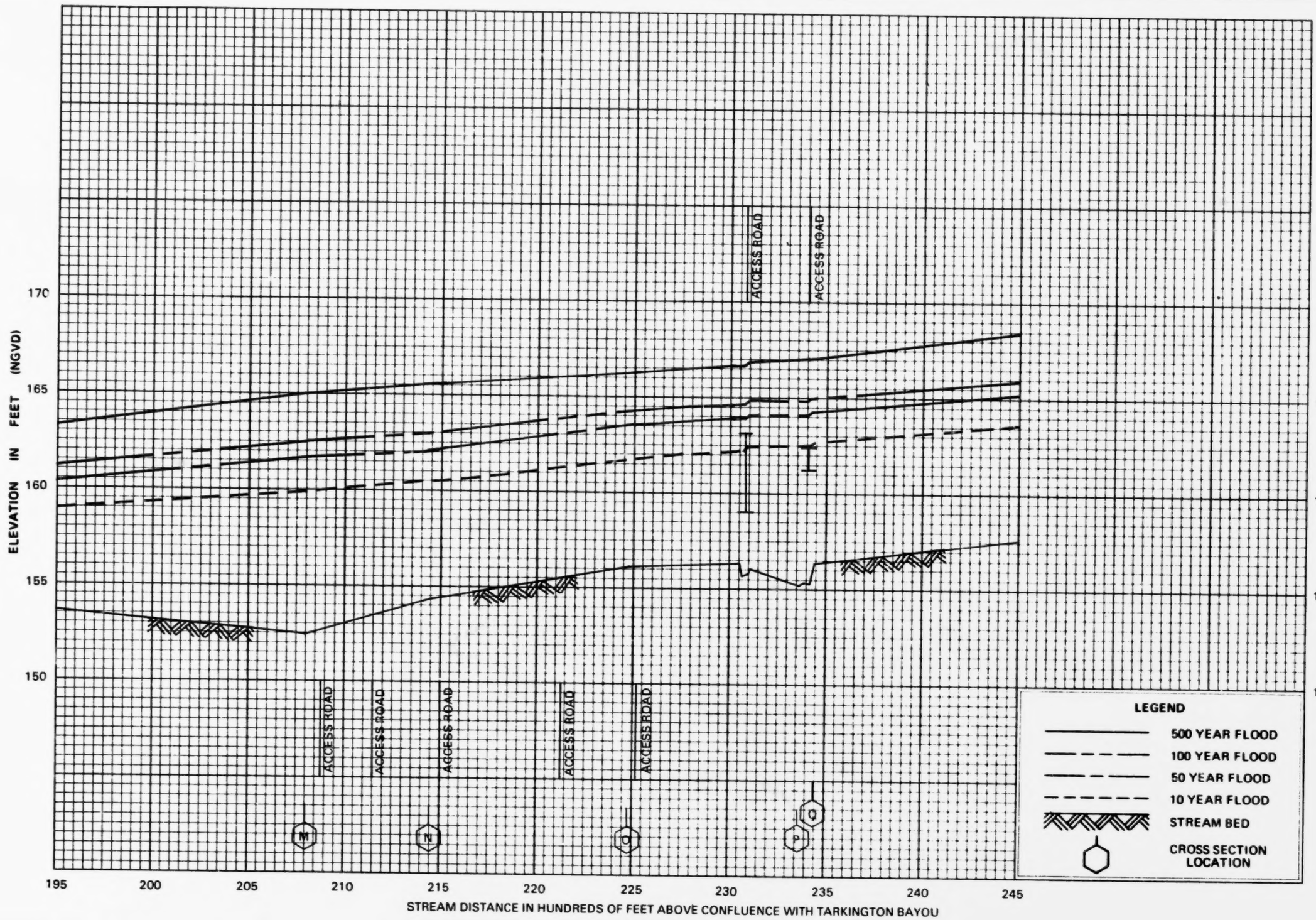
REESE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

64P

124466



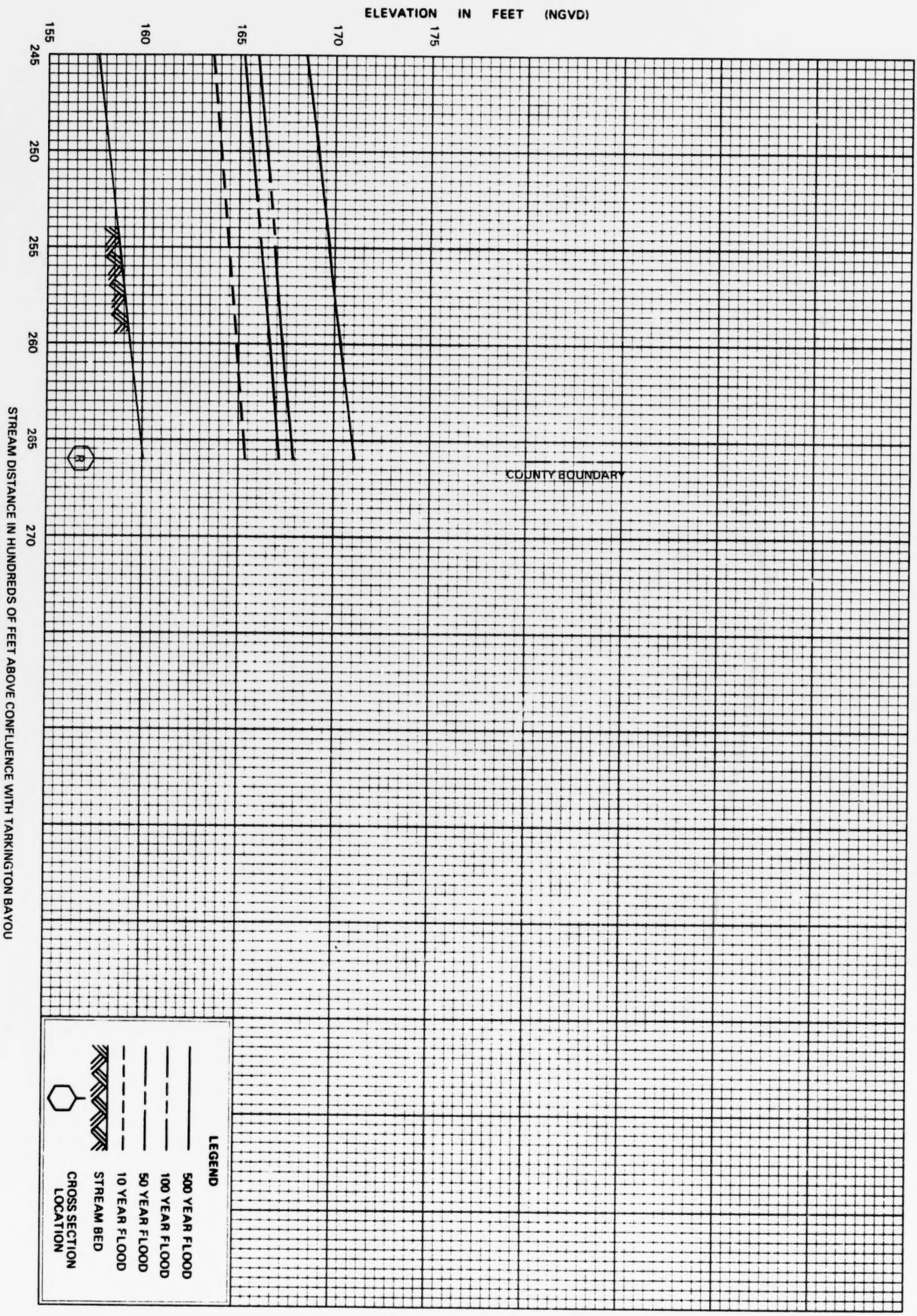
FLOOD PROFILES

REESE BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

65P



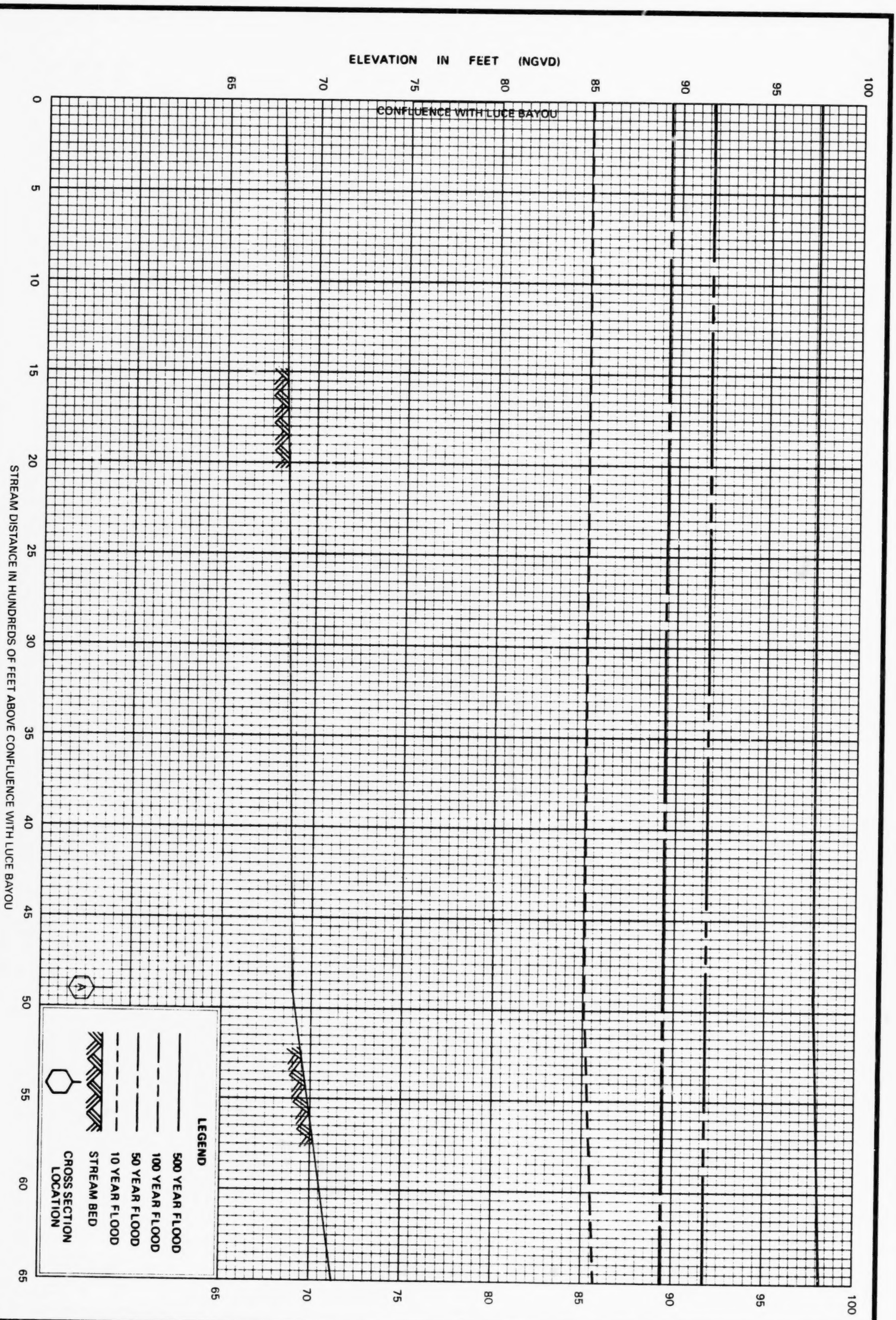
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

REESE BAYOU

66P

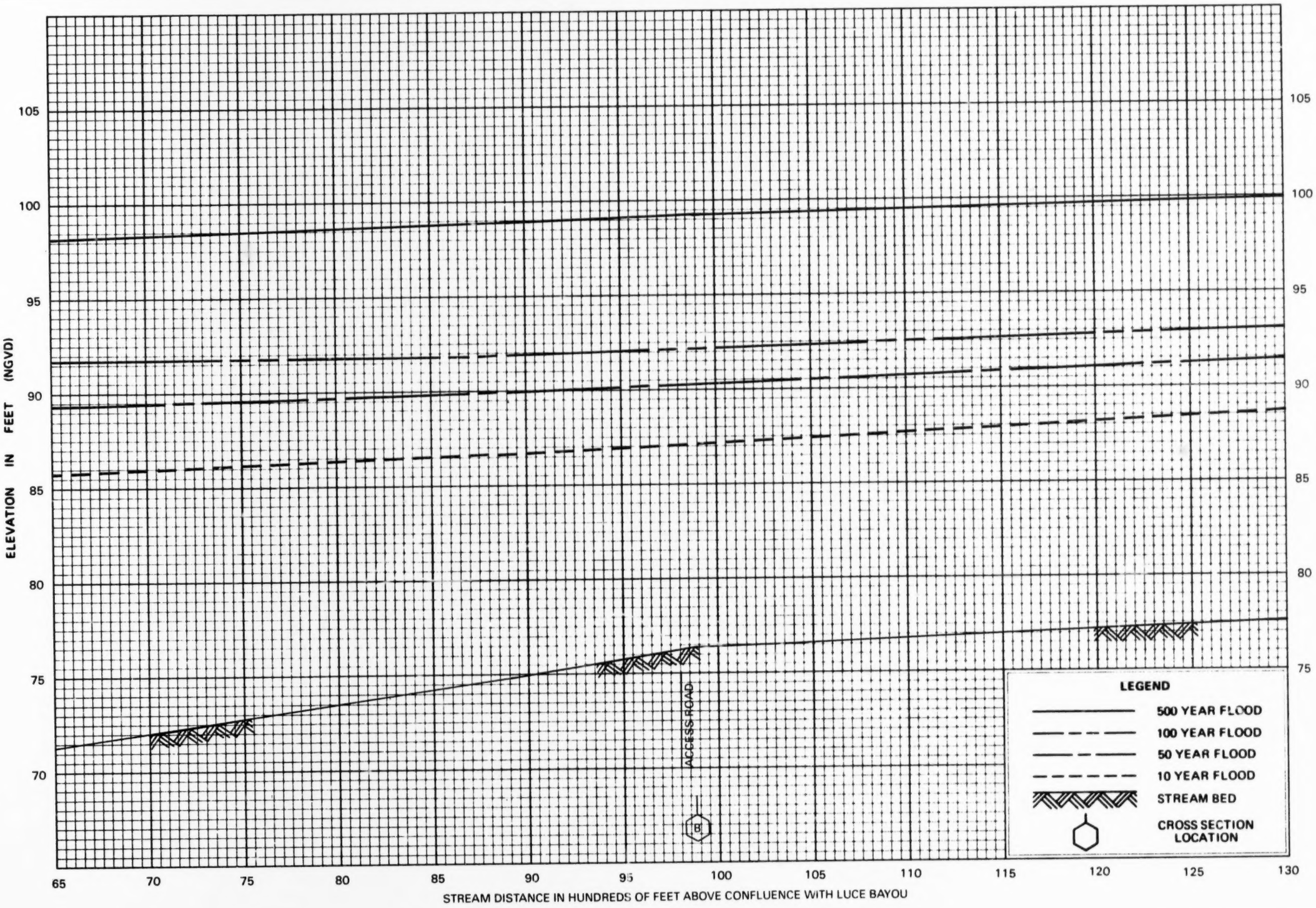


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TARKINGTON BAYOU



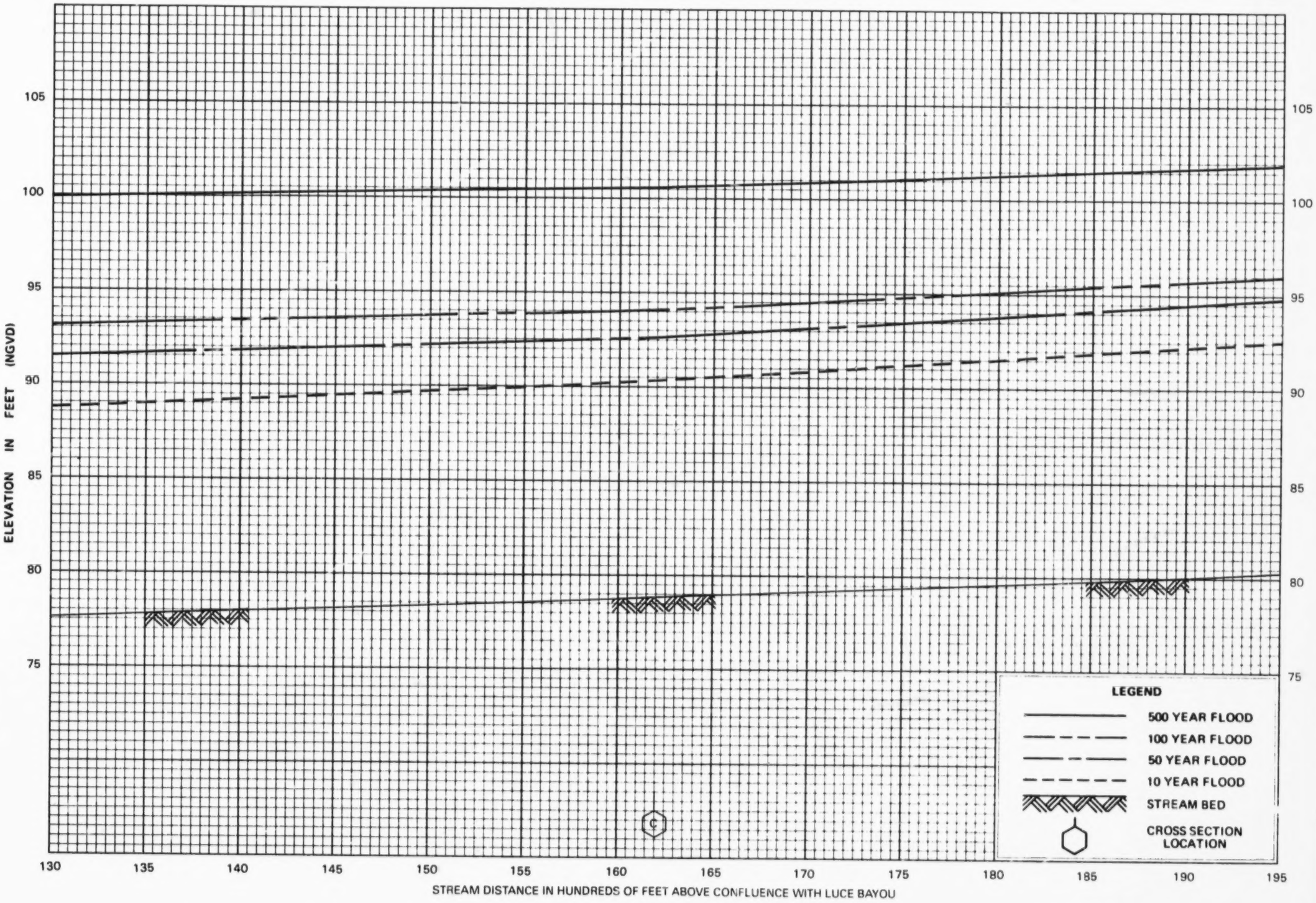
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

68P



FLOOD PROFILES

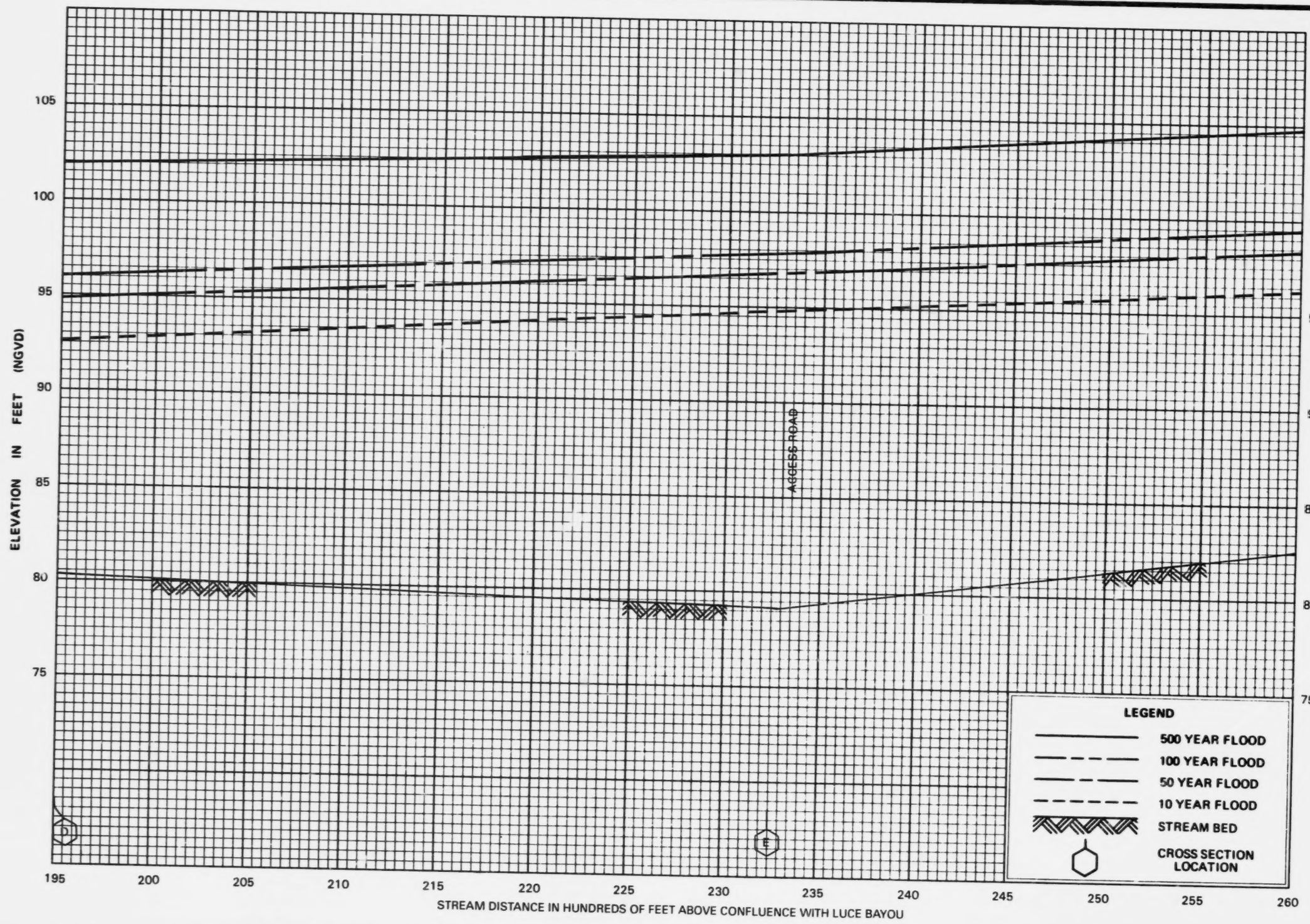
TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

69P

134466



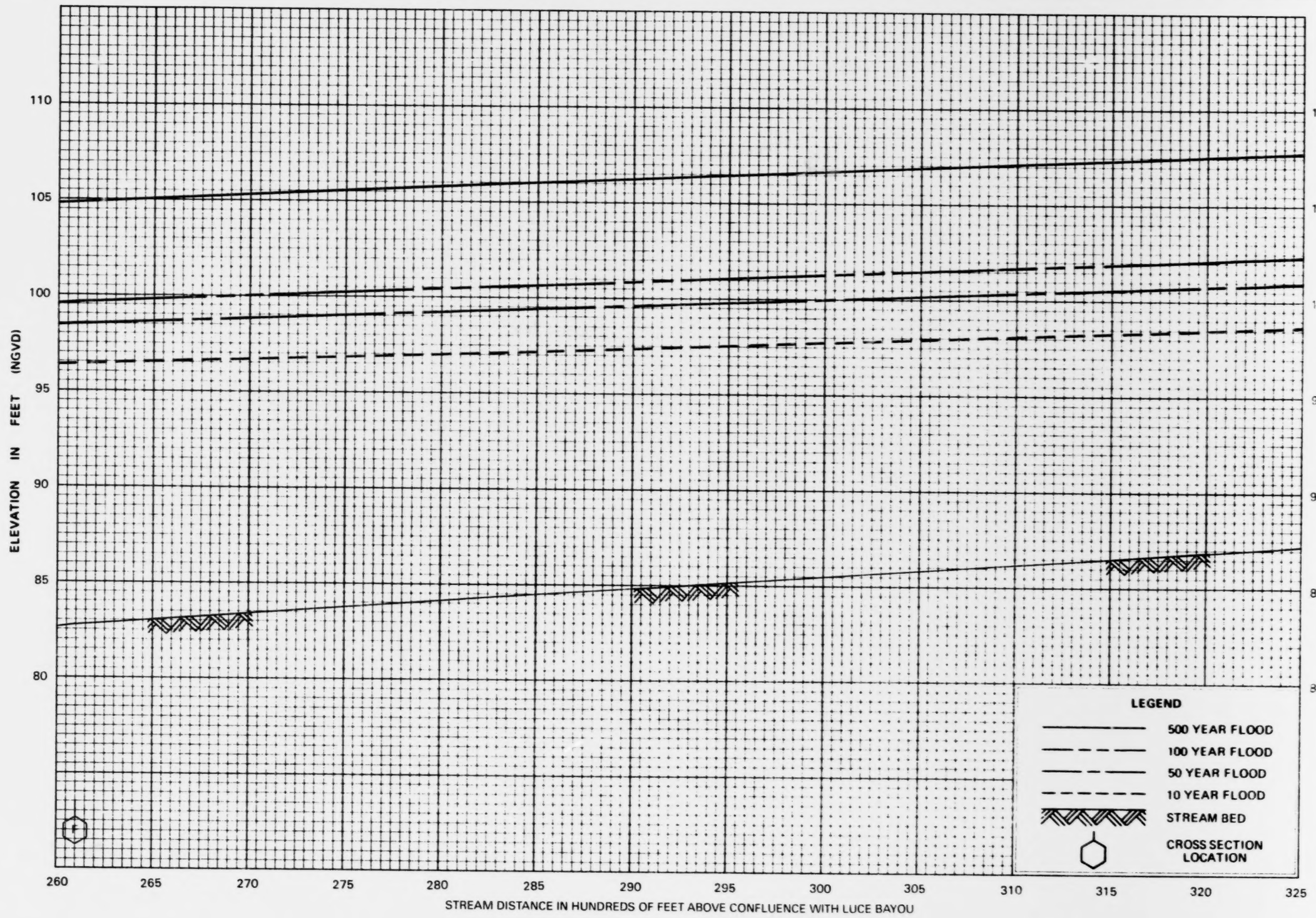
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

70P



FLOOD PROFILES

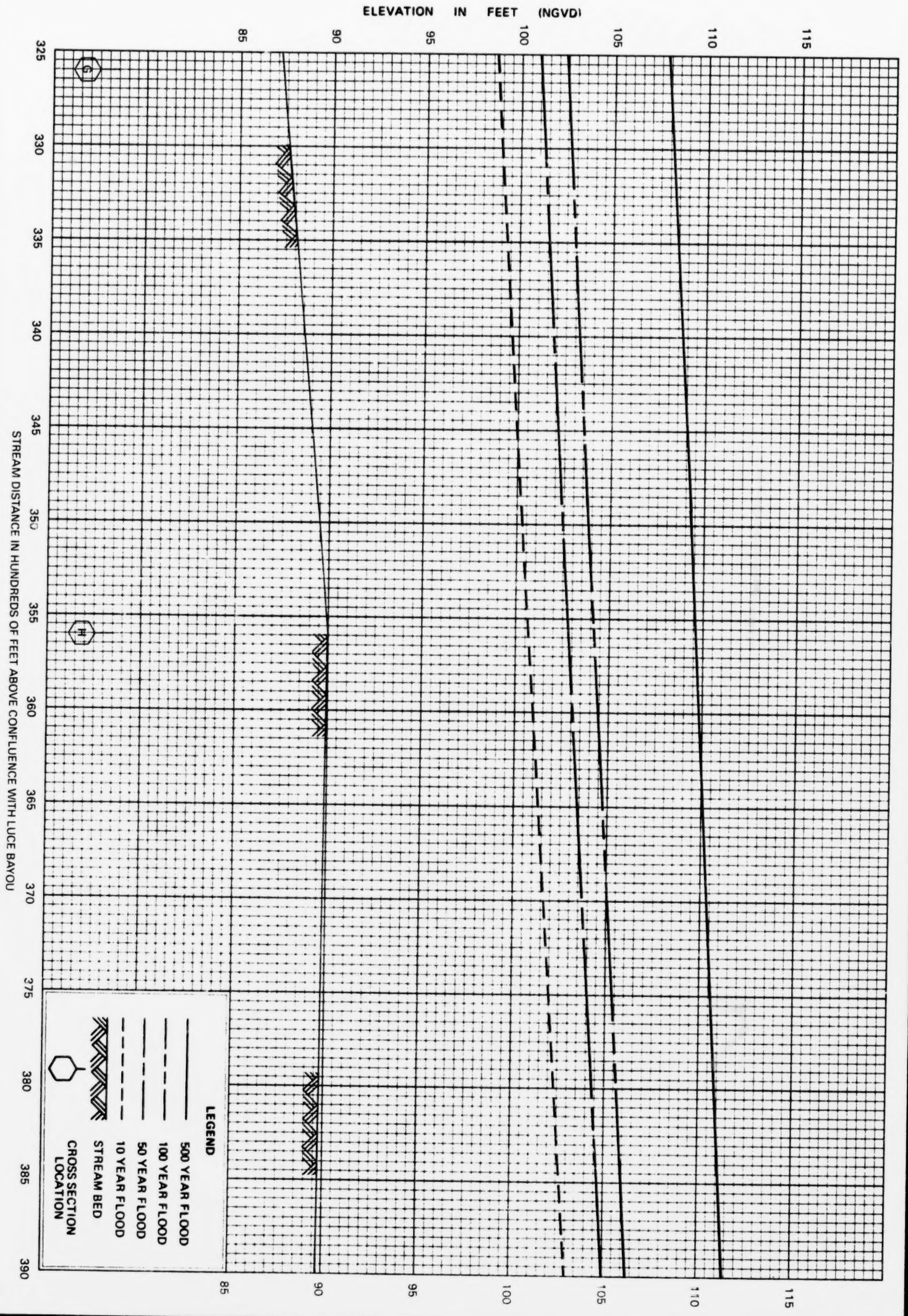
TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

71P

134466



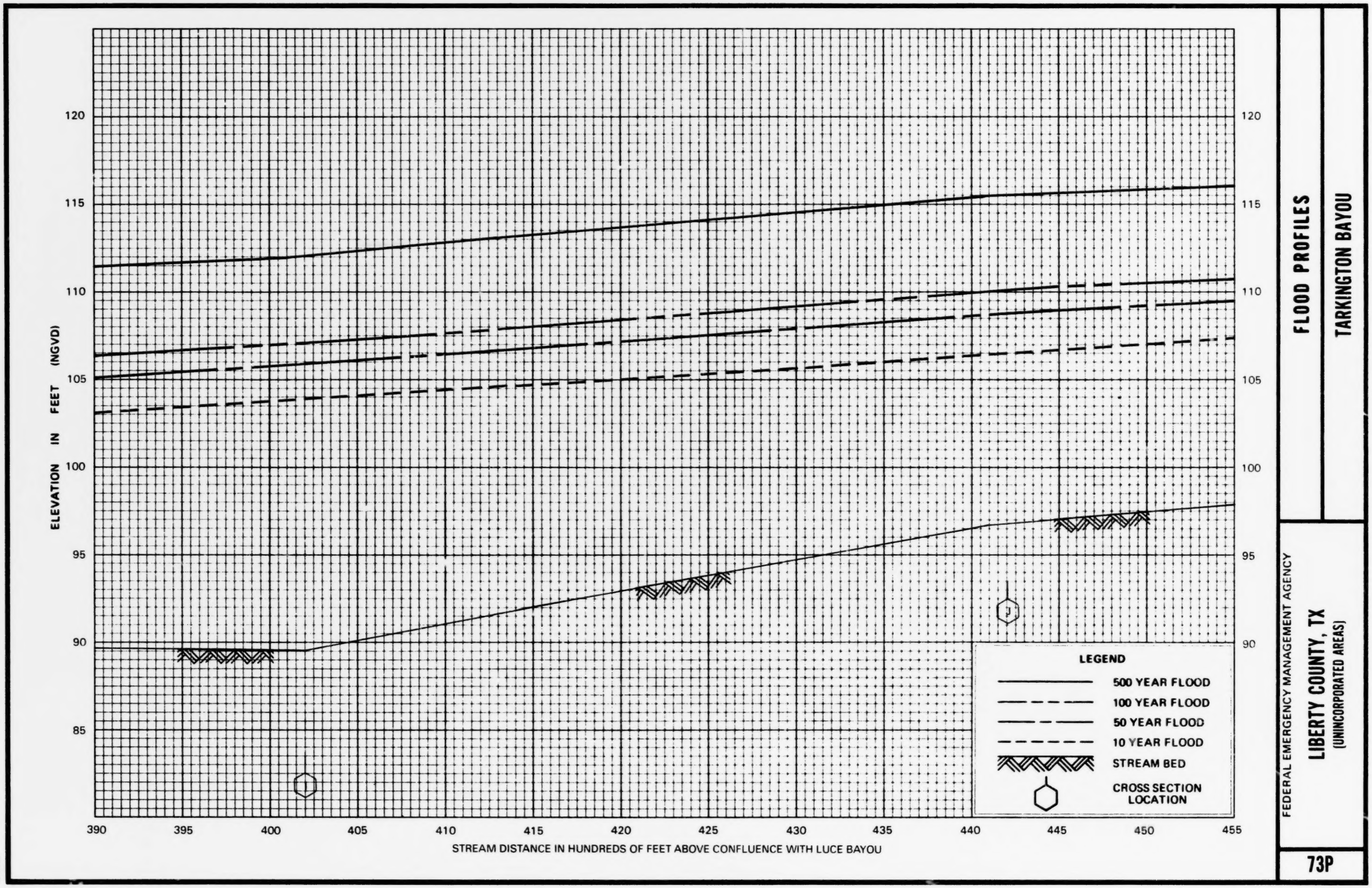
72P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TARKINGTON BAYOU



FLOOD PROFILES

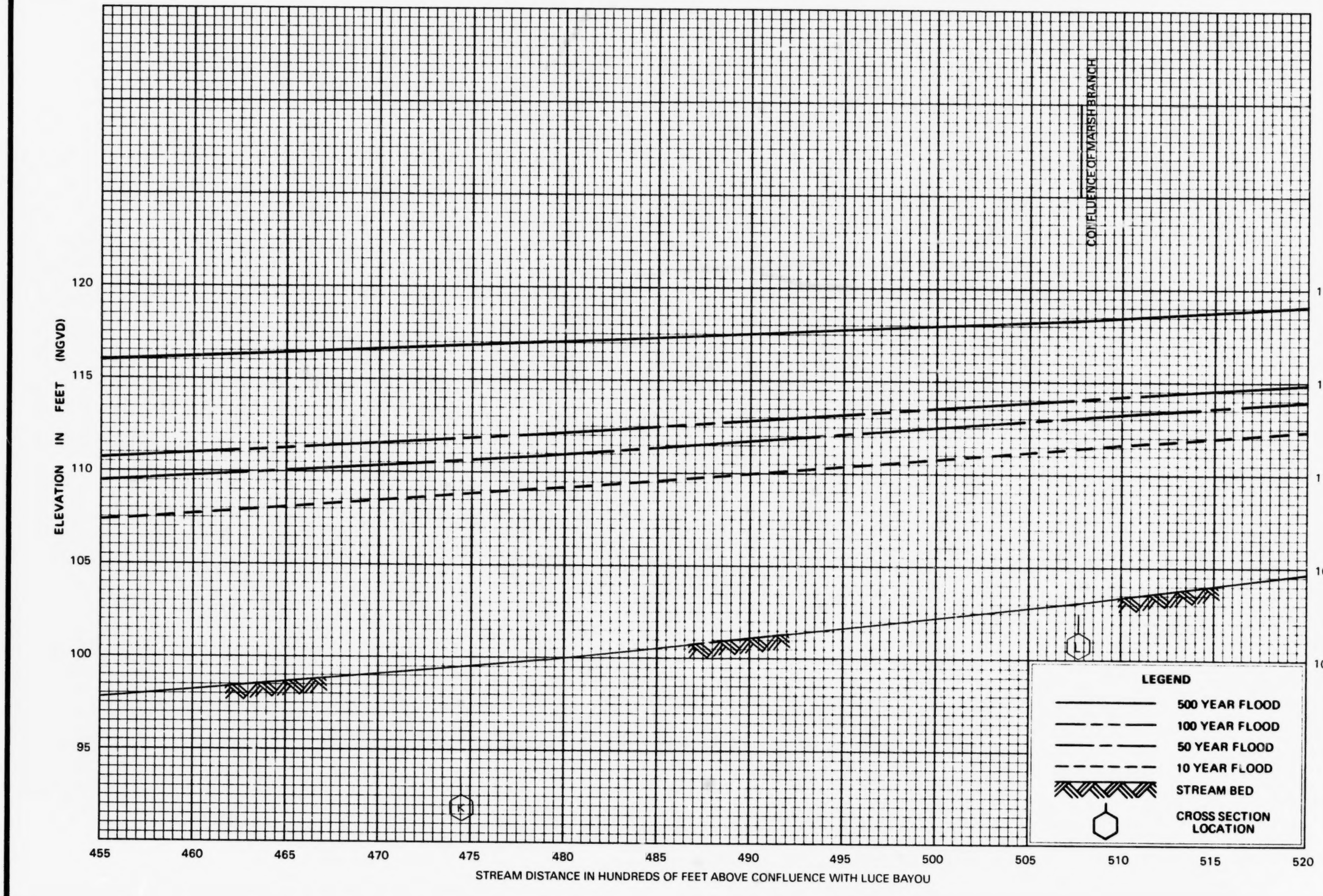
TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

73P

124488



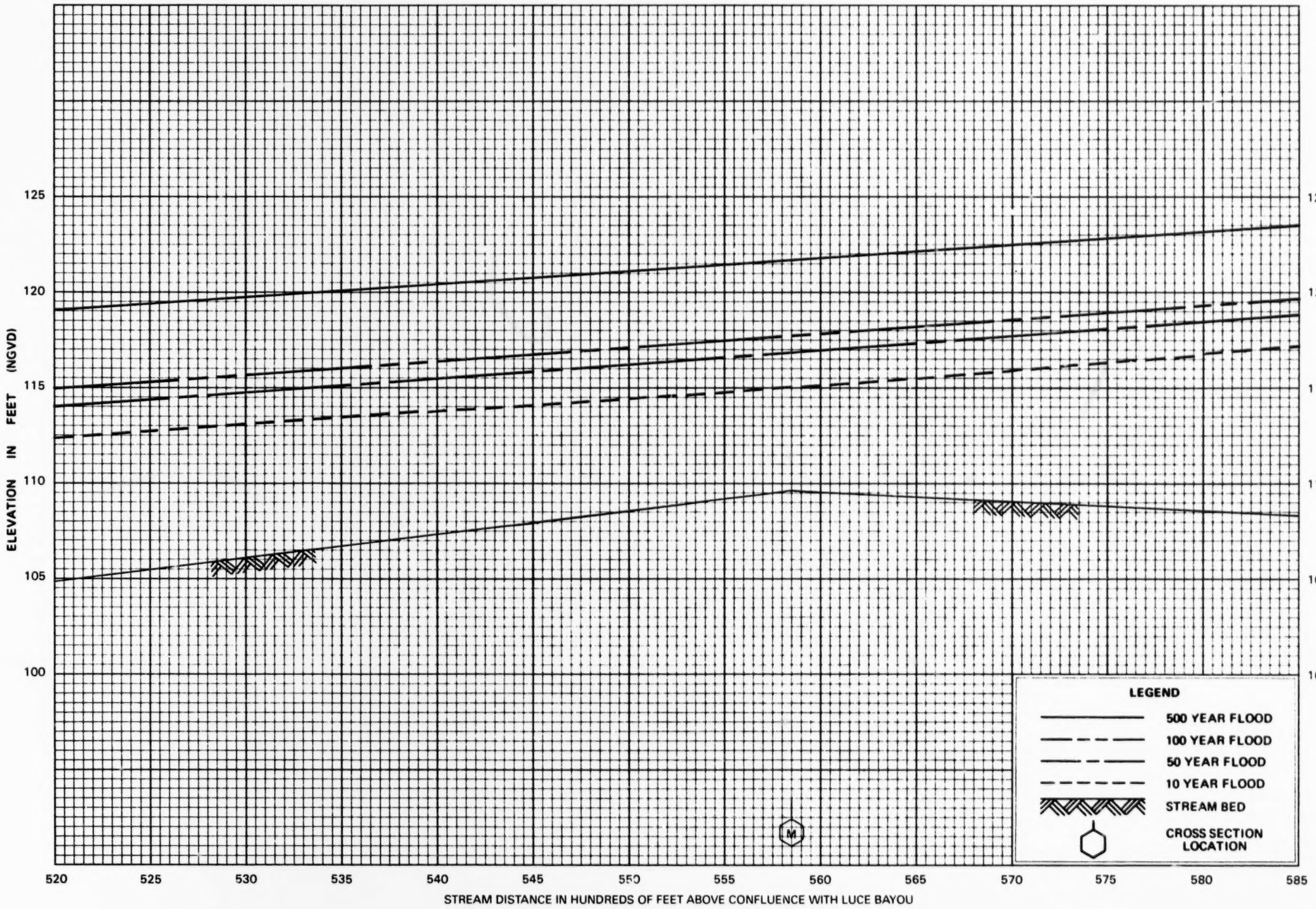
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

74P



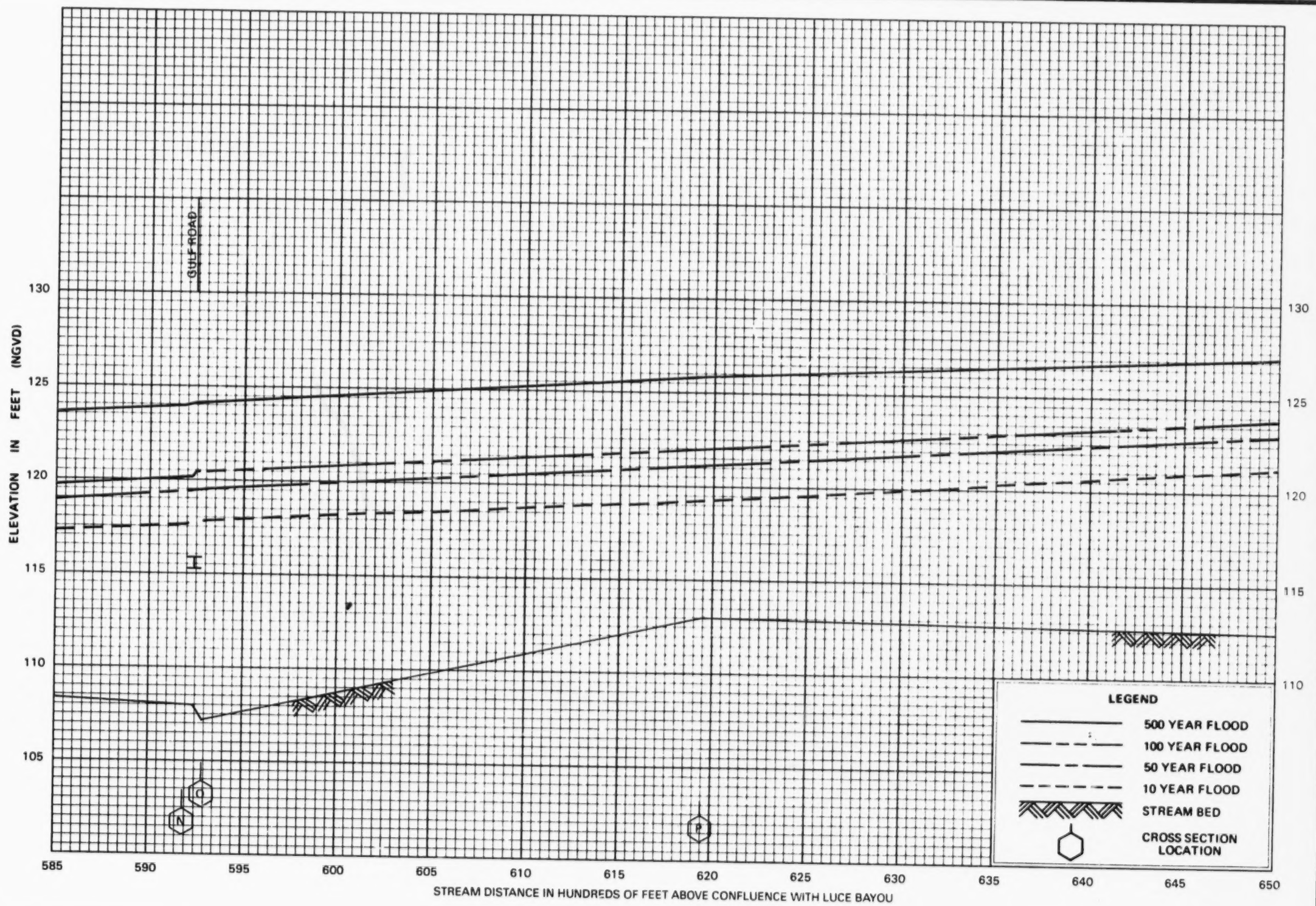
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

75P



FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

76P

ELEVATION IN FEET (NGVD)

135
130
125
120
115
110

650 655 660 665 670 675 680 685 690 695 700 705 710 715

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH LUCE BAYOU

Q

R

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

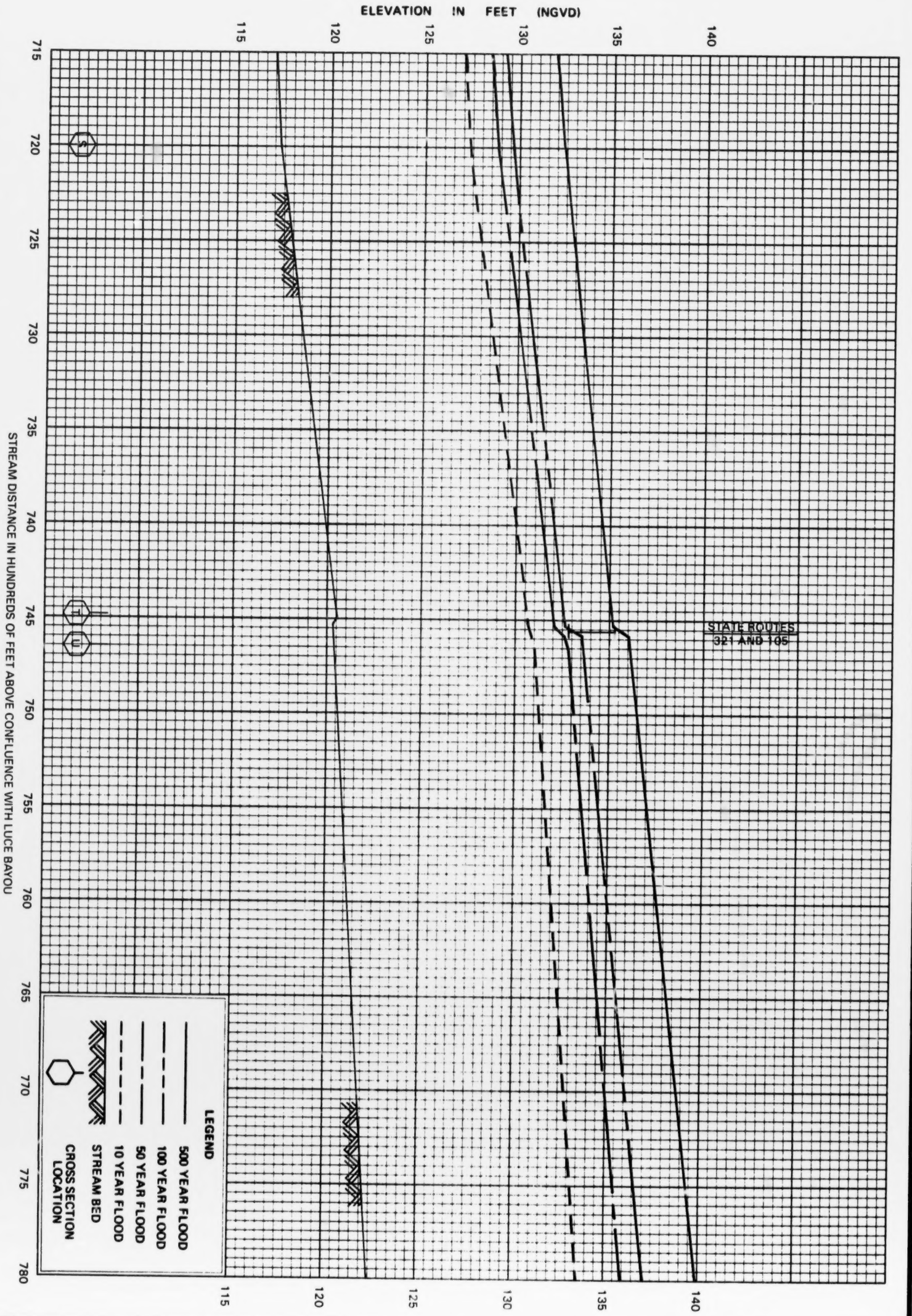
TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

77P



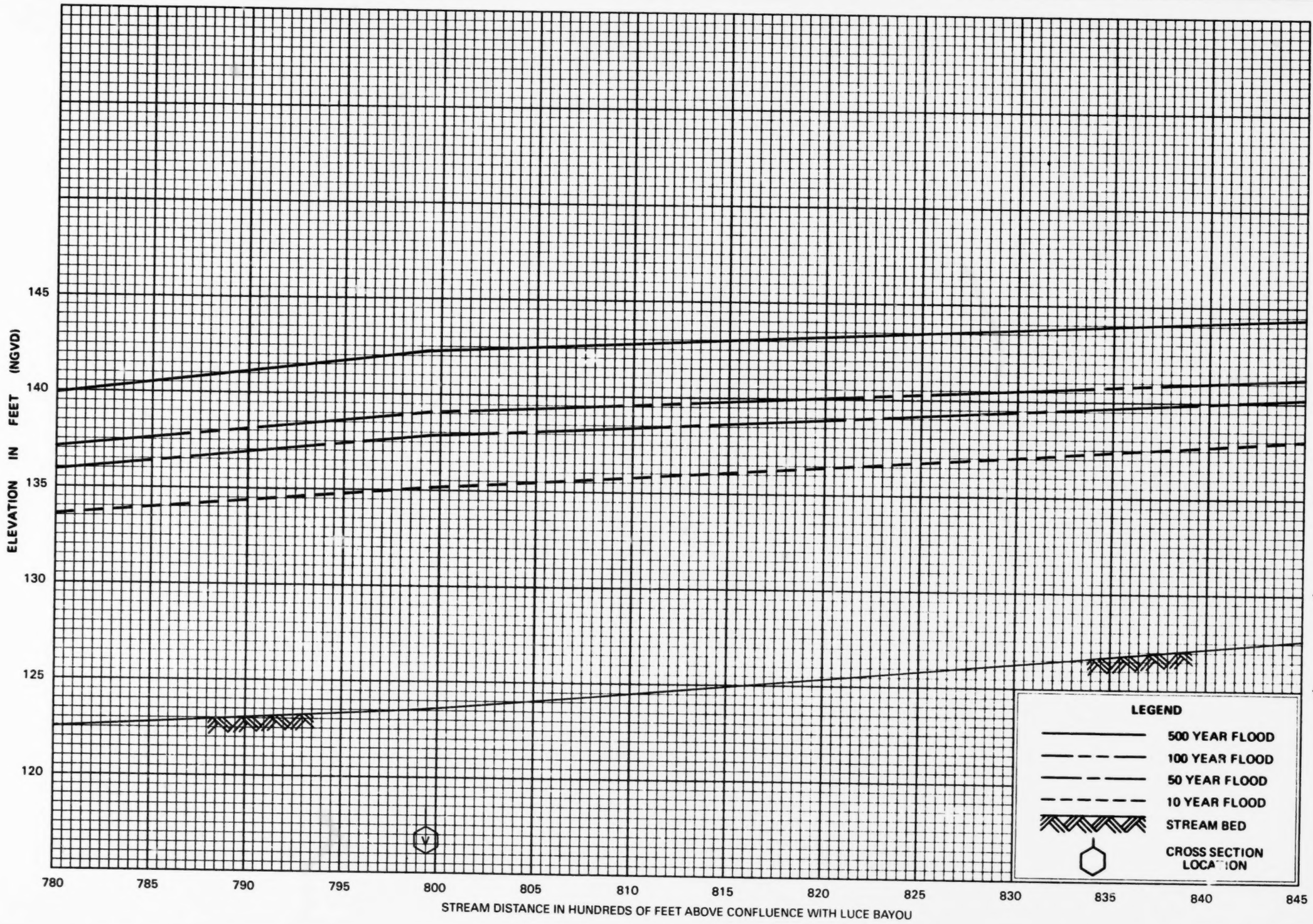
78P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TARKINGTON BAYOU

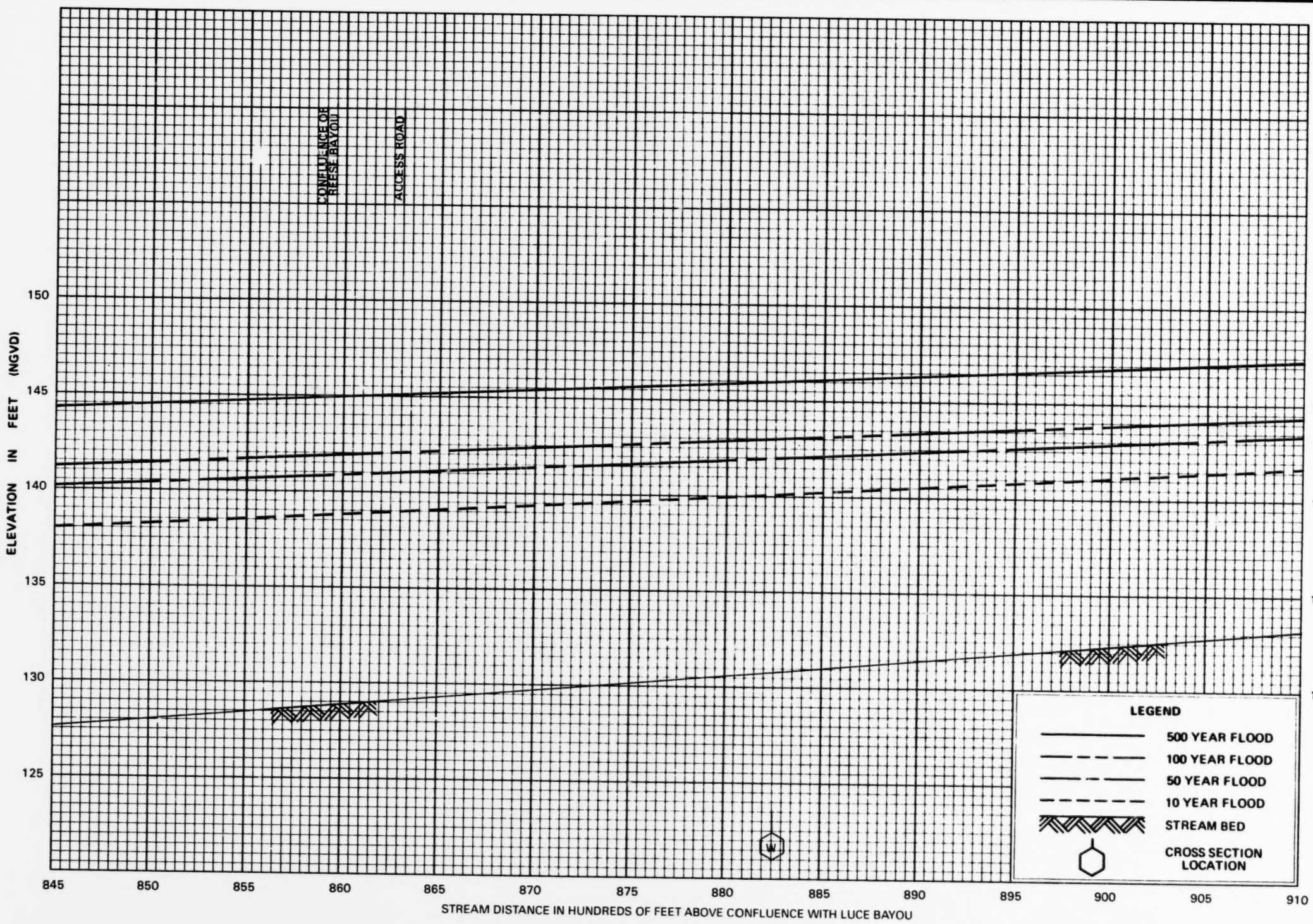


FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)



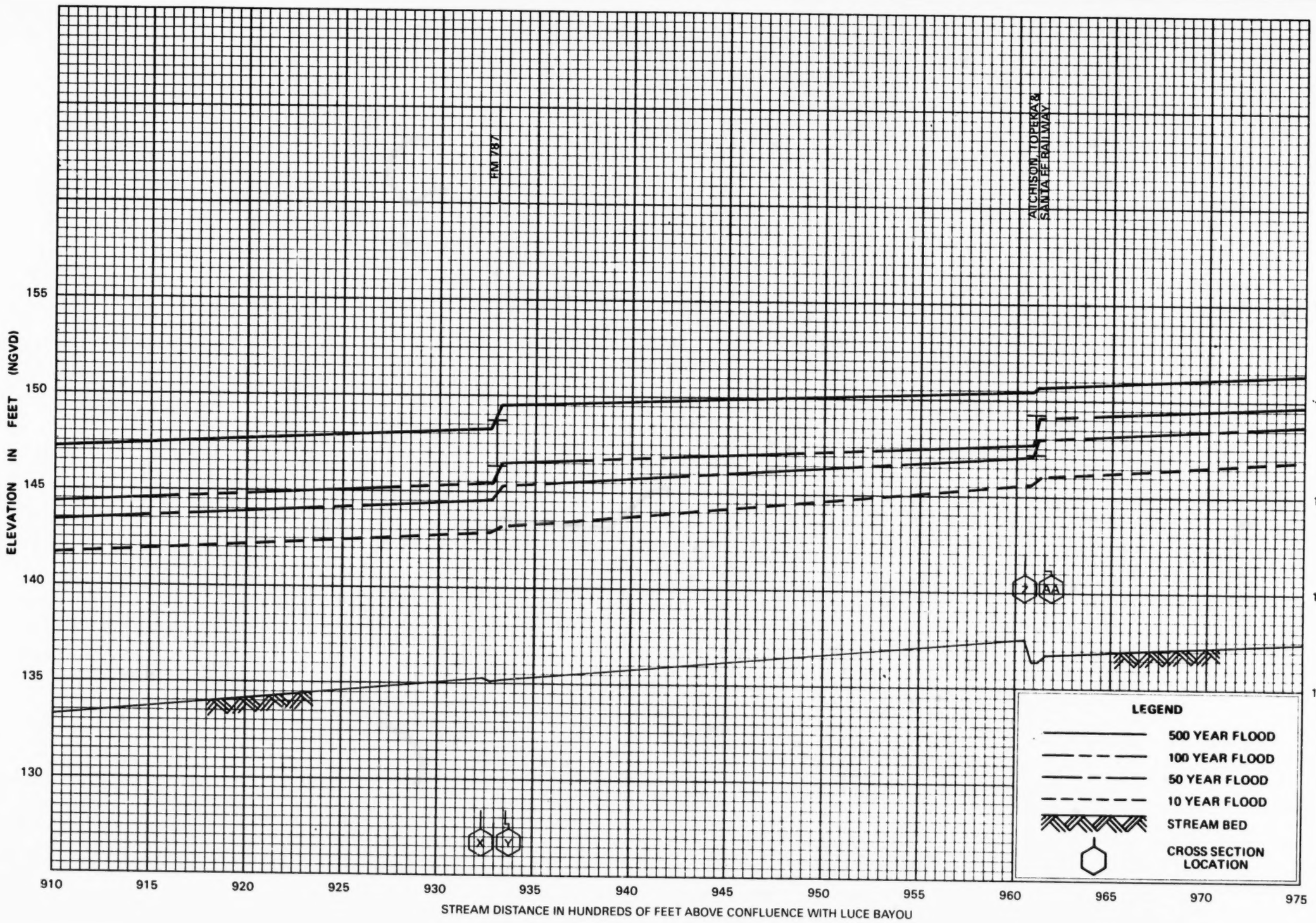
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

80P



FLOOD PROFILES

TARKINGTON BAYOU

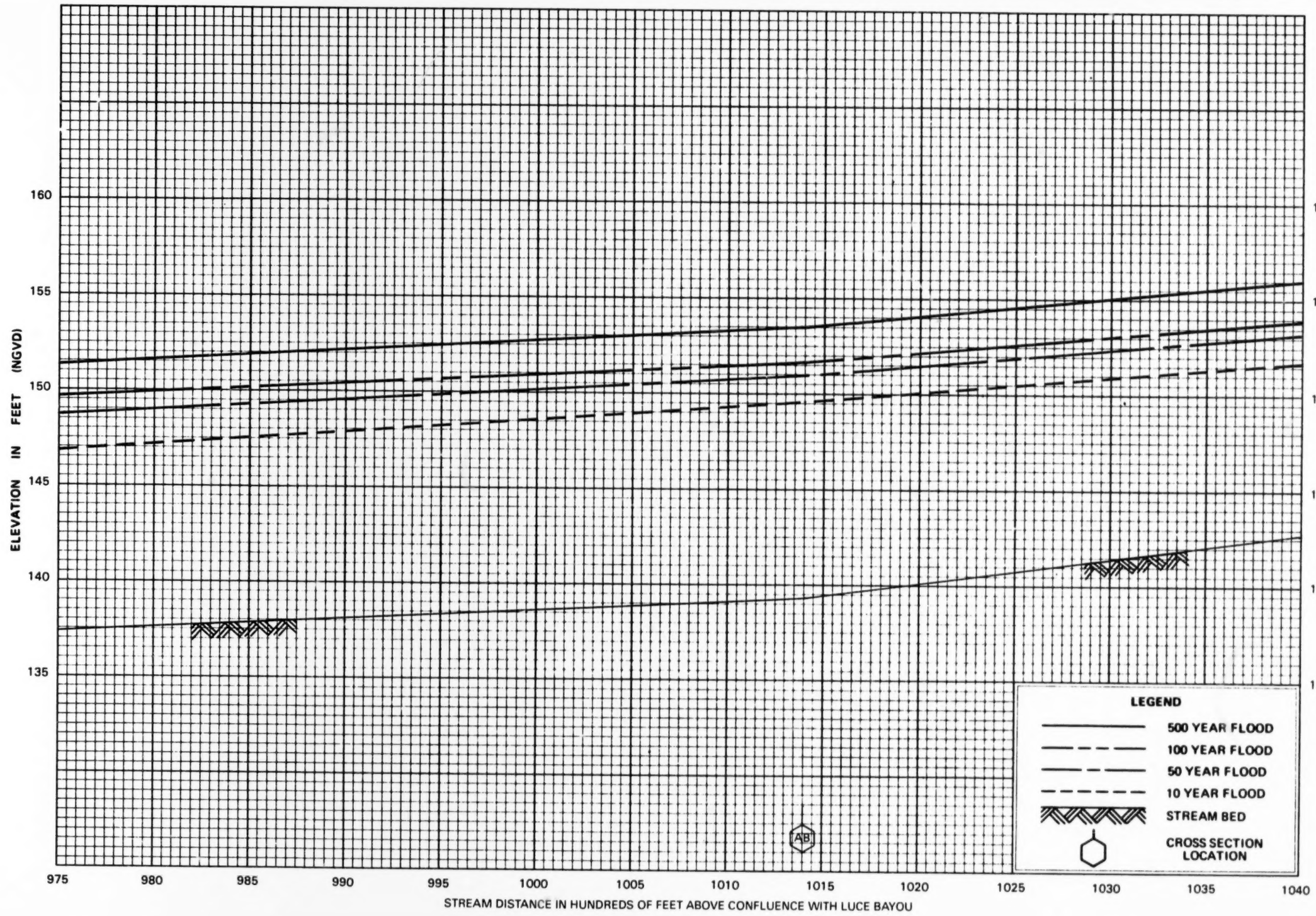
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX

(UNINCORPORATED AREAS)

81P

134486



FLOOD PROFILES

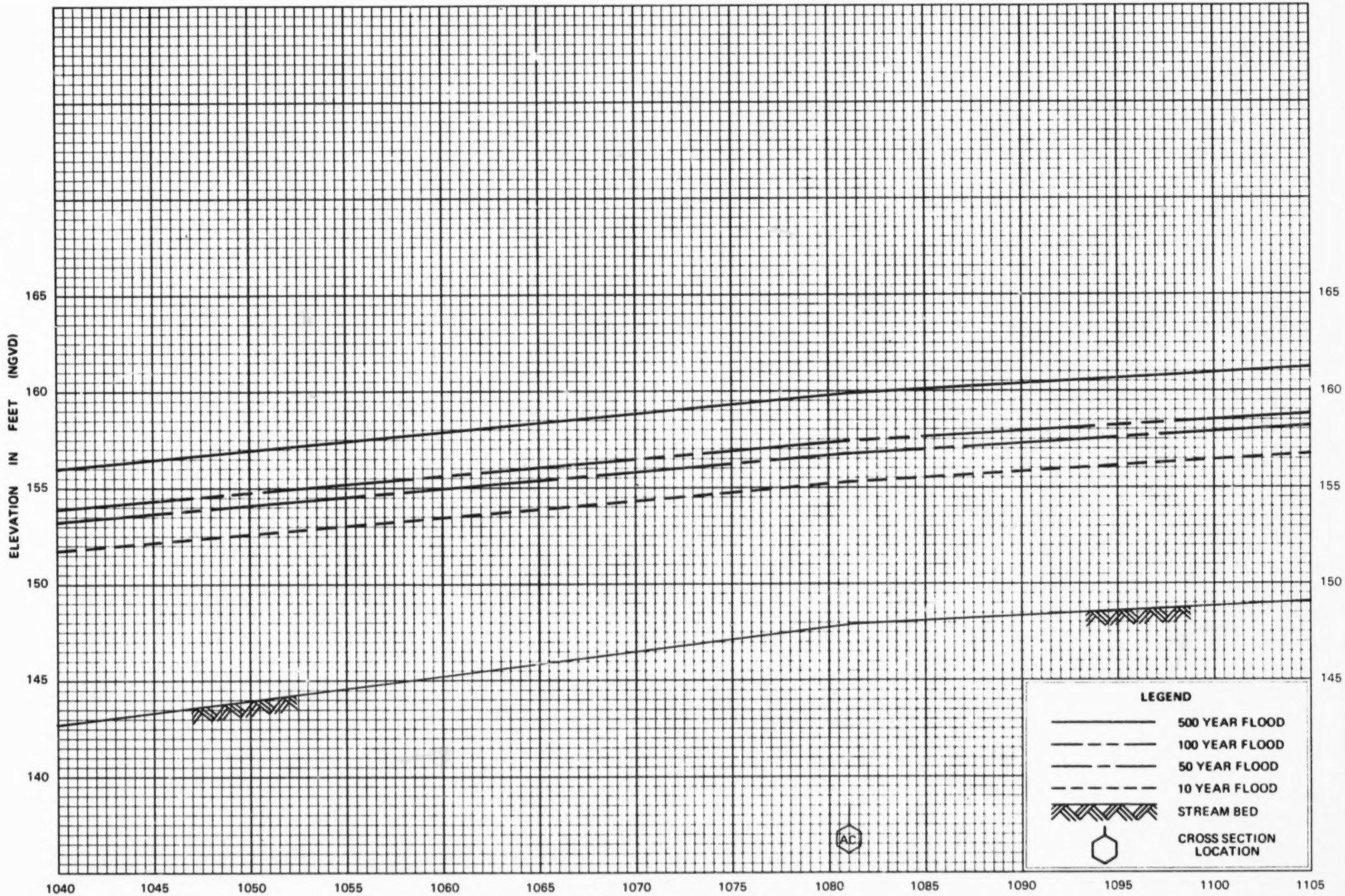
TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

82P

134466



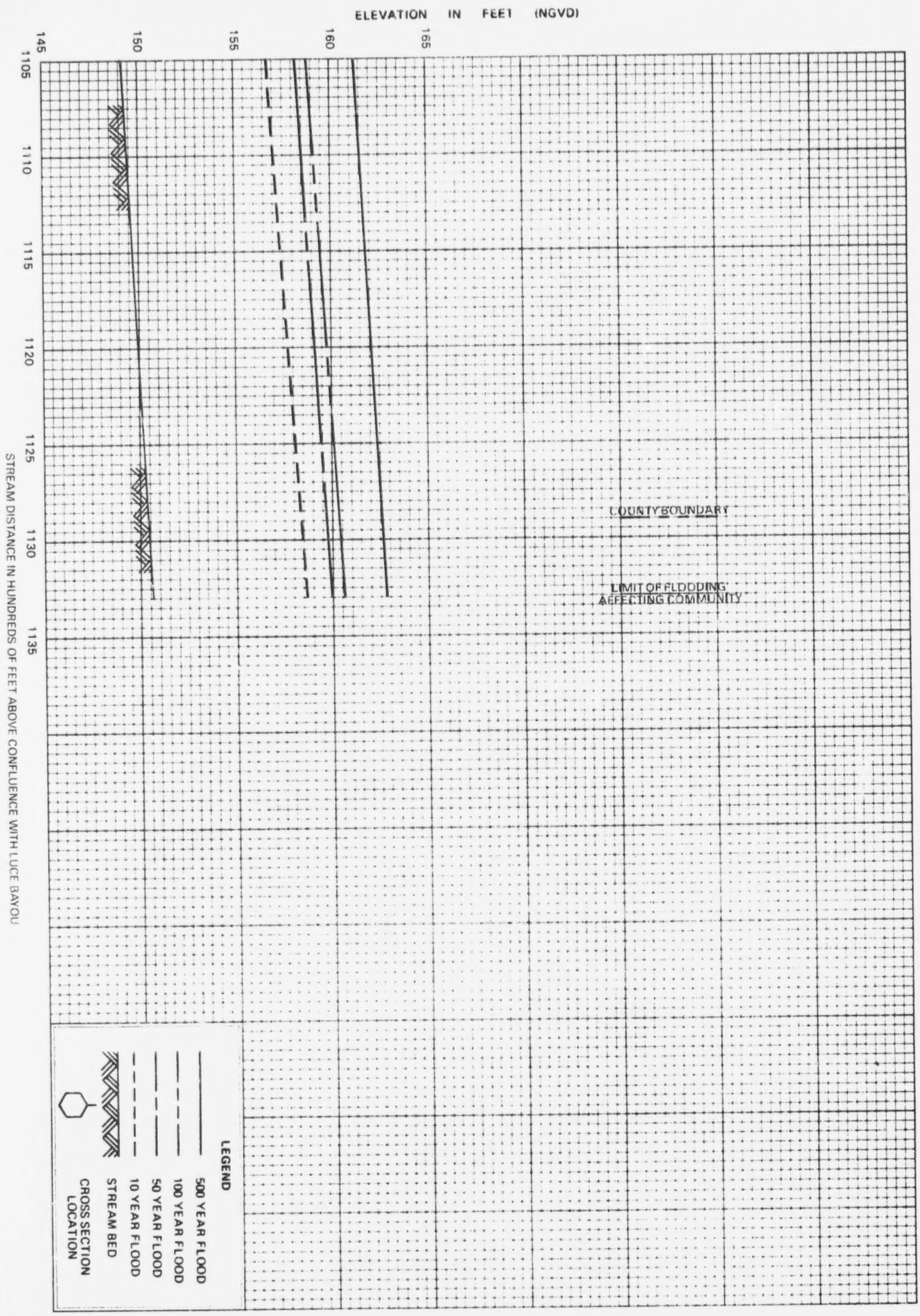
FLOOD PROFILES

TARKINGTON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

83P

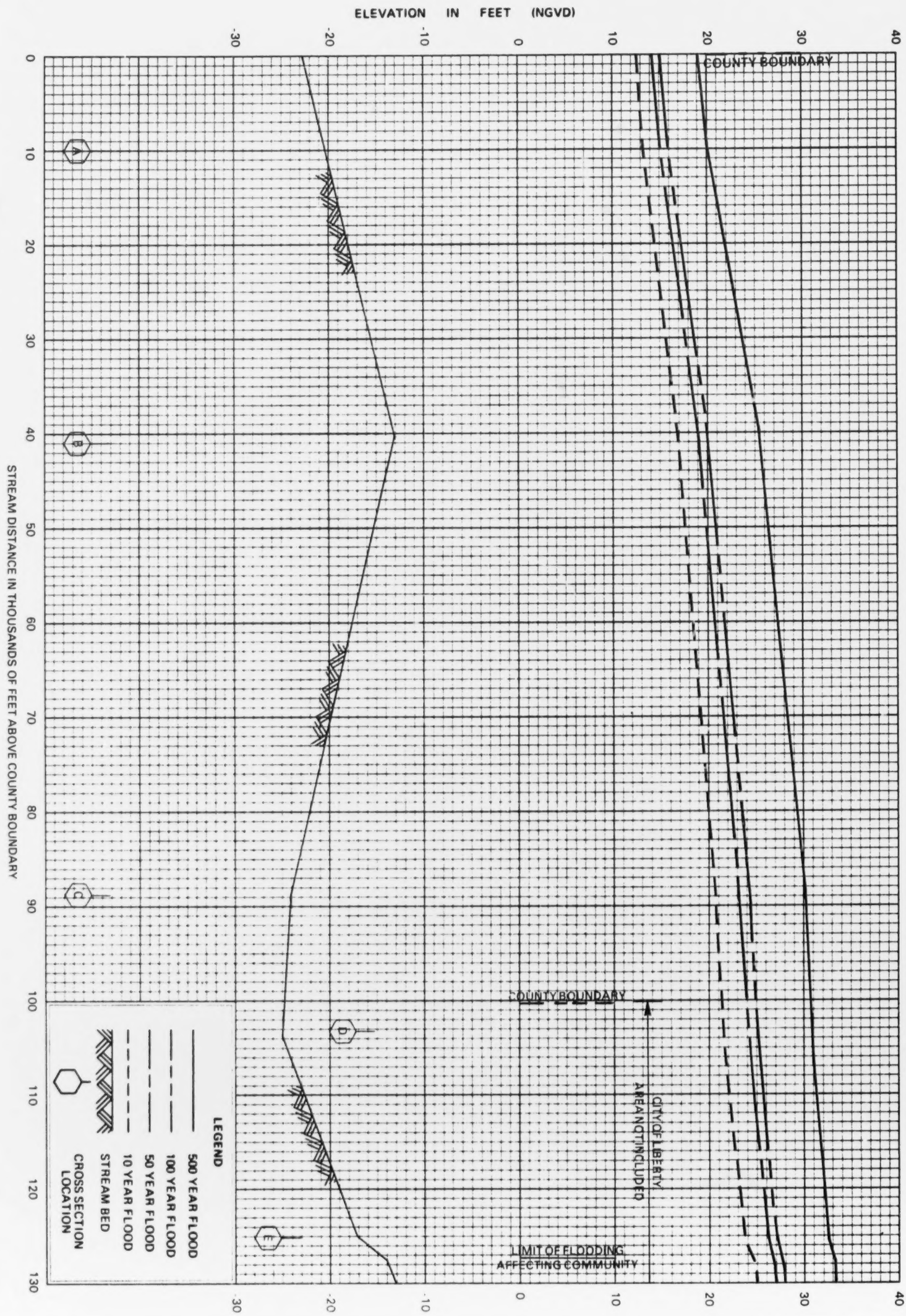


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TARKINGTON BAYOU

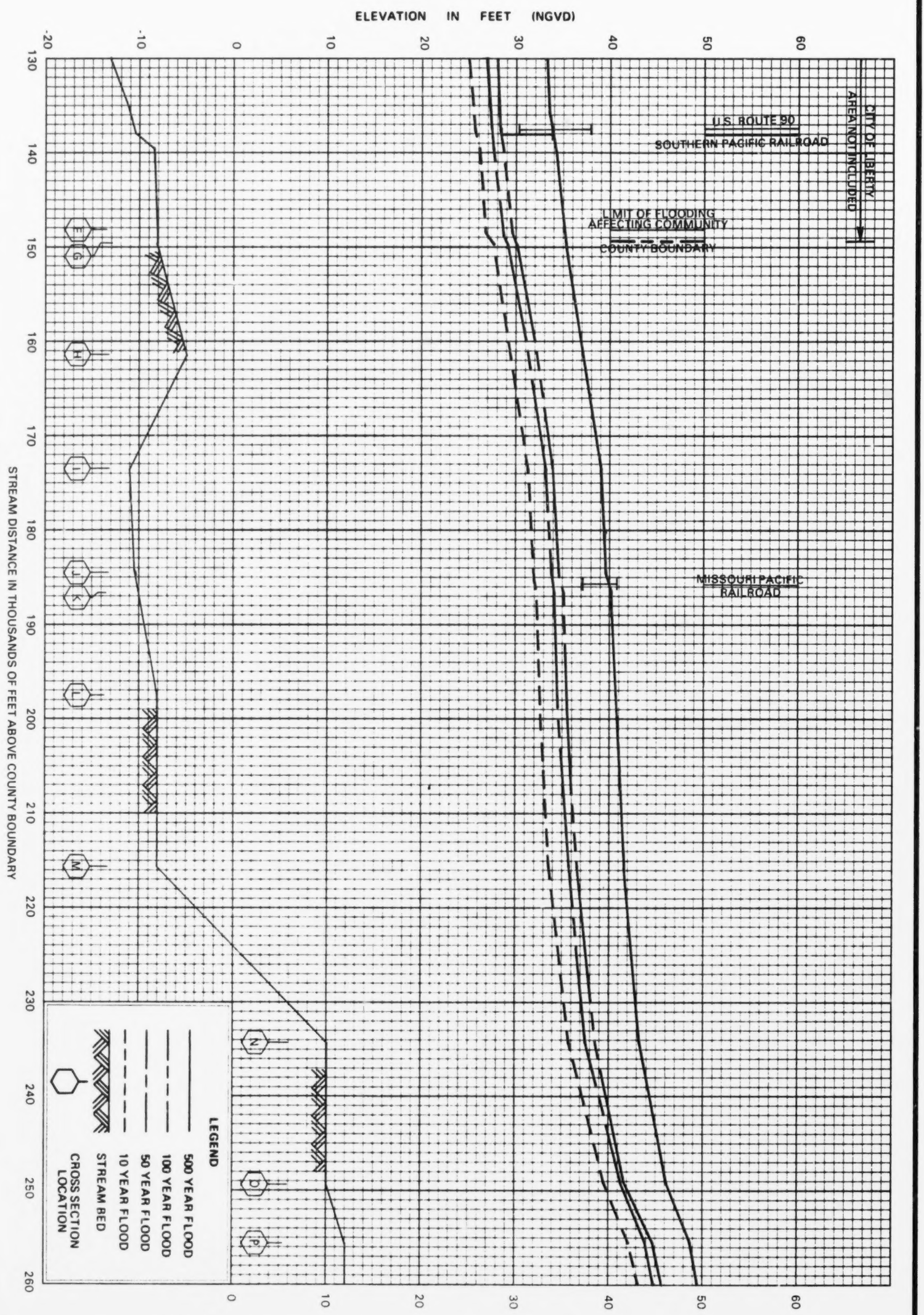


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRINITY RIVER



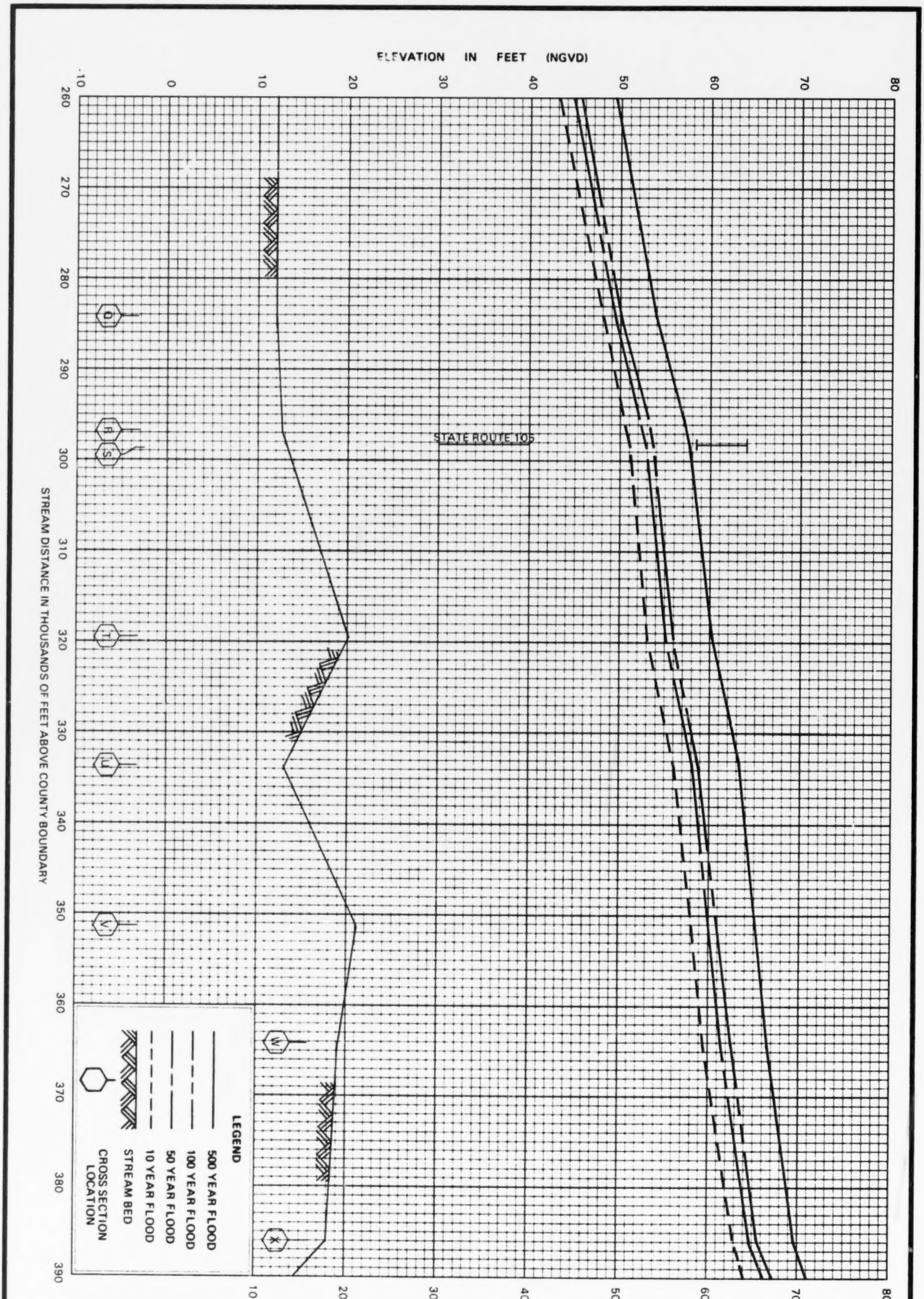
86P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRINITY RIVER



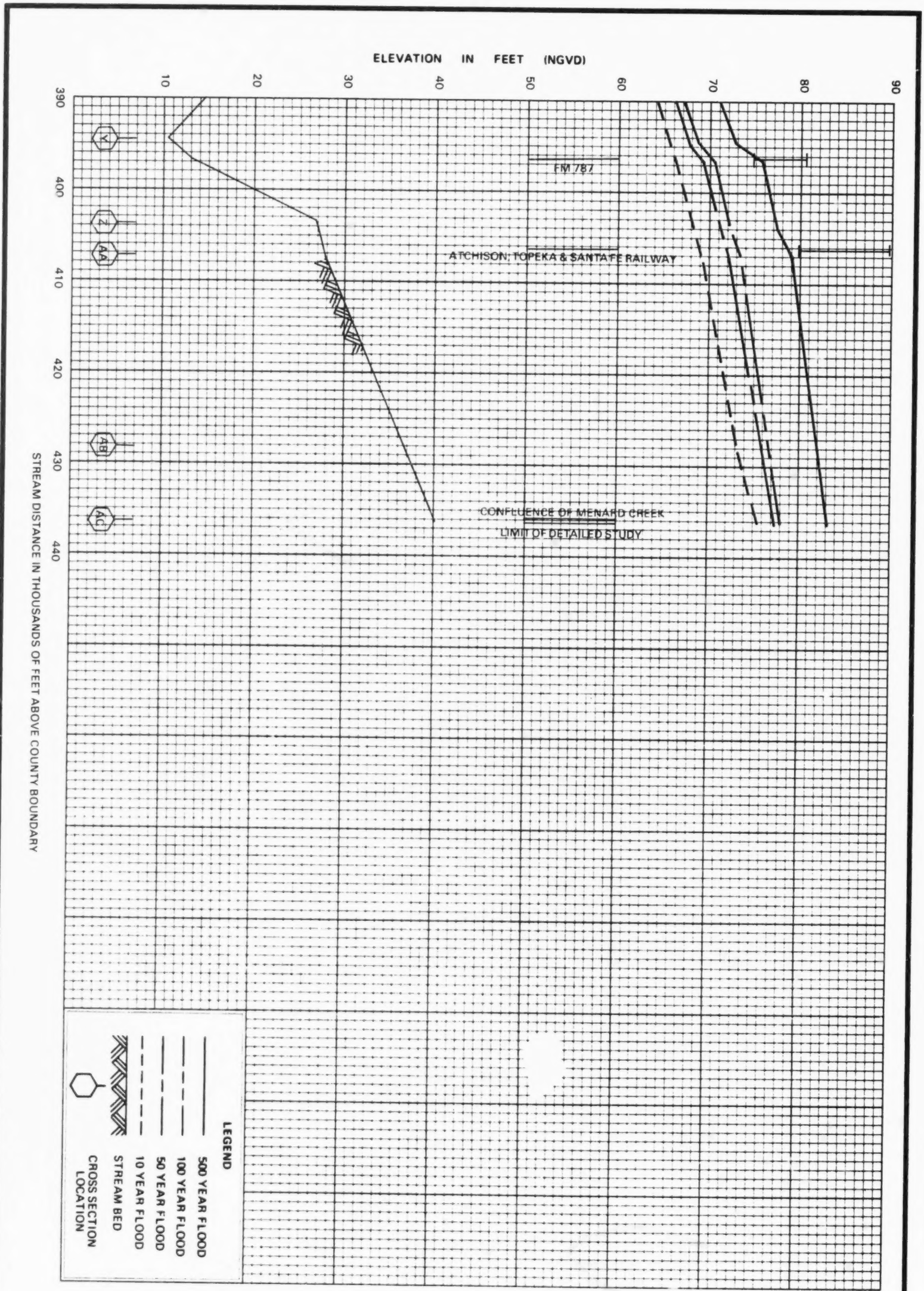
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRINITY RIVER

87P



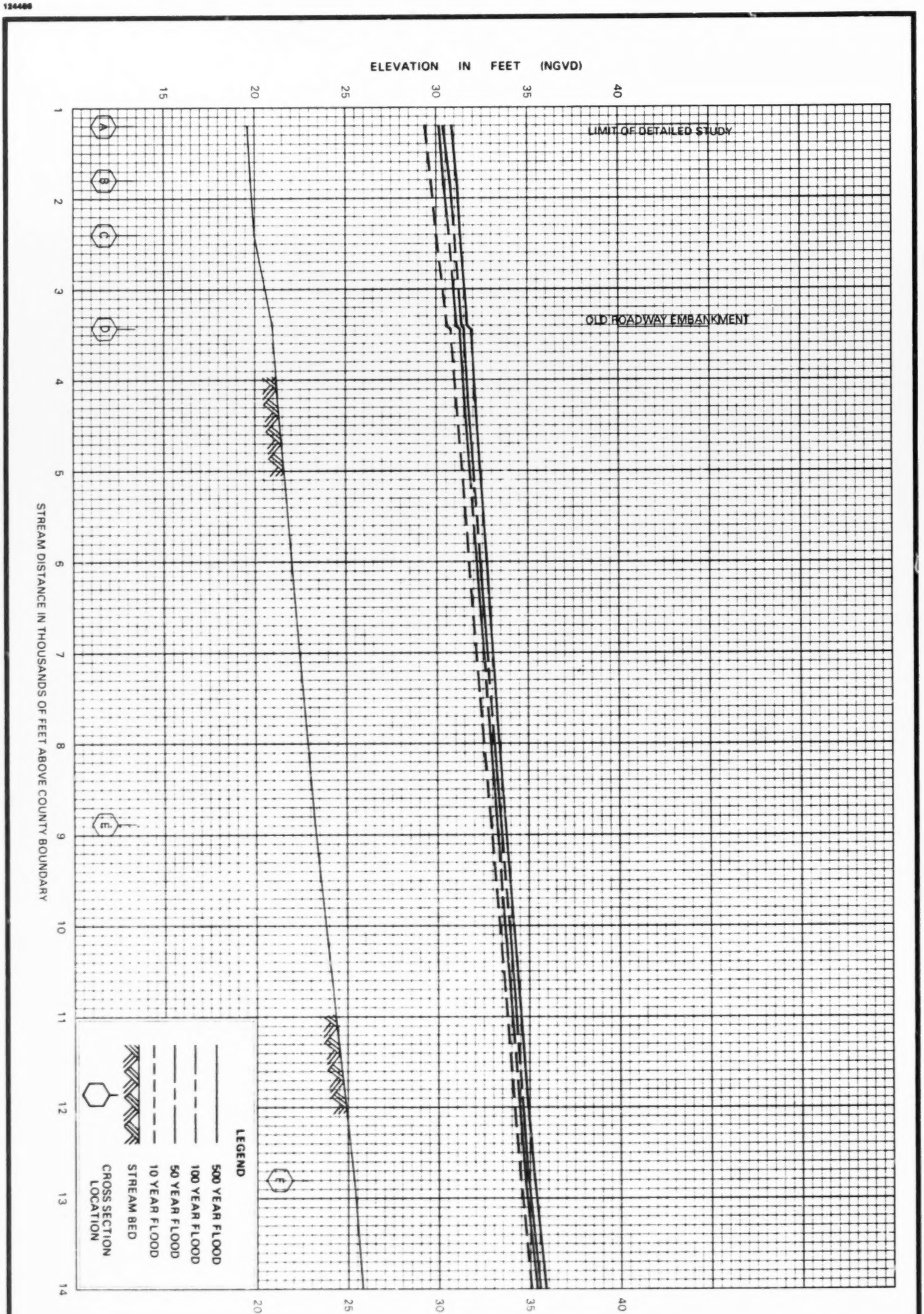
88P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRINITY RIVER



FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TURTLE BAYOU

89P

FLOOD PROFILES

TURTLE BAYOU

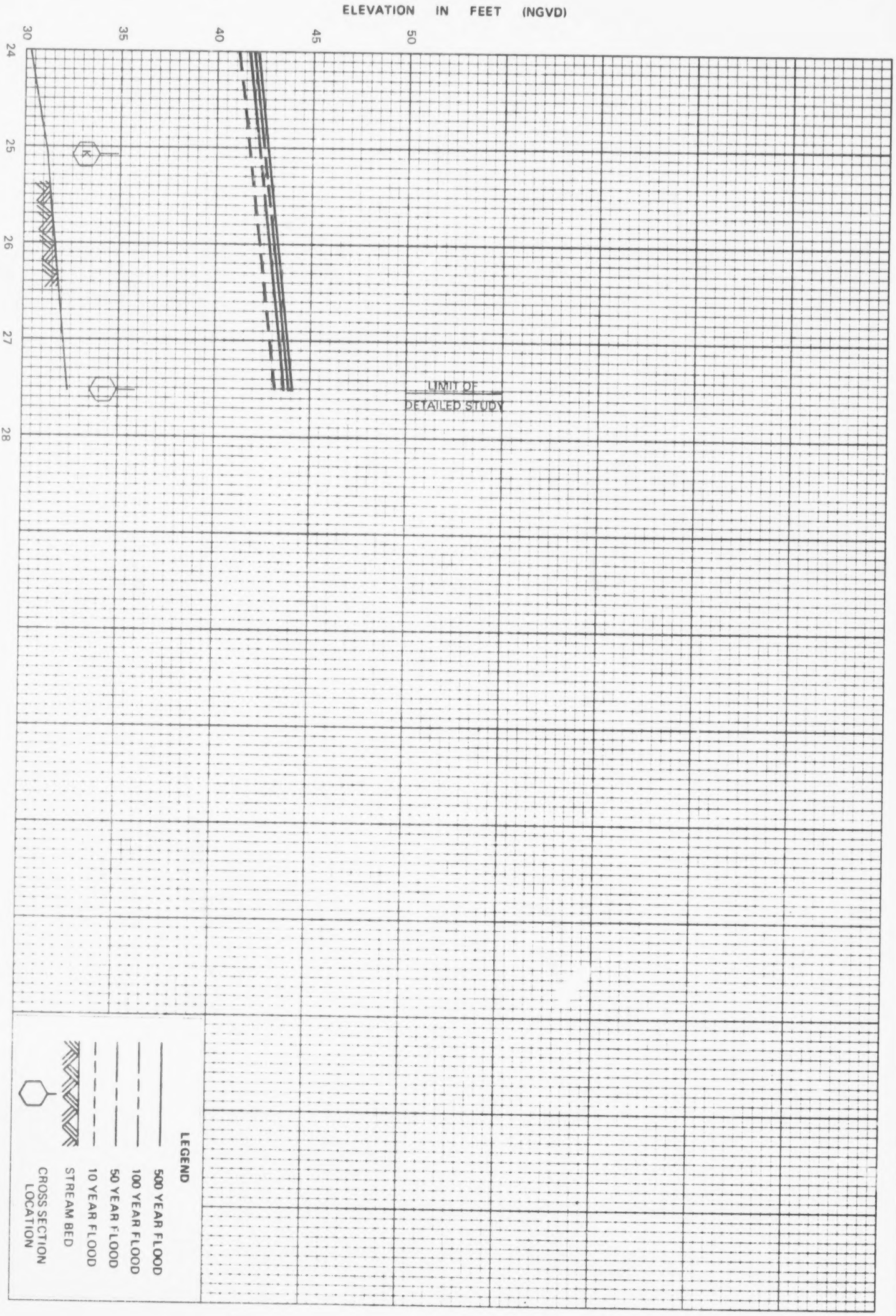
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

90P

124488

150

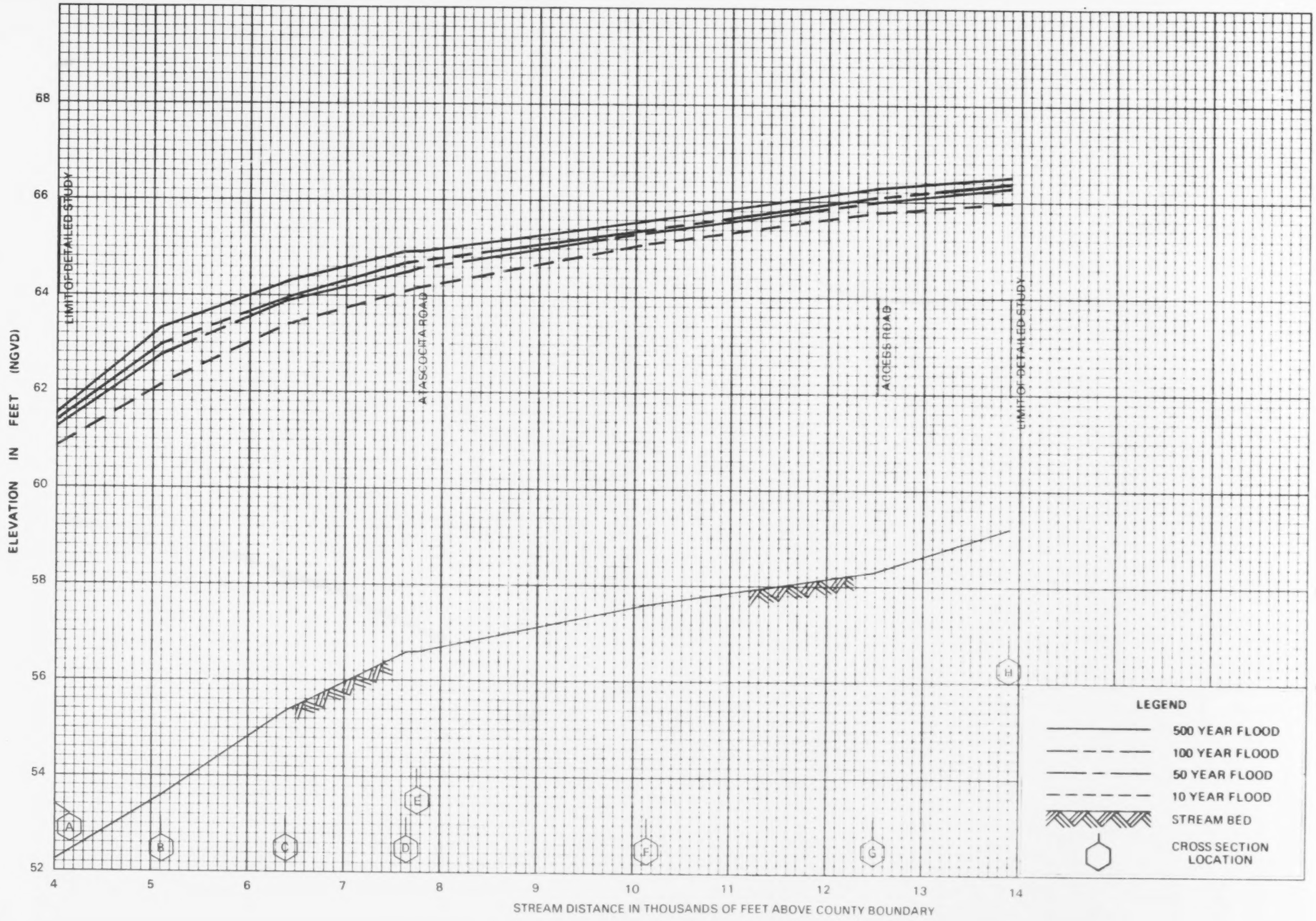


FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

TURTLE BAYOU



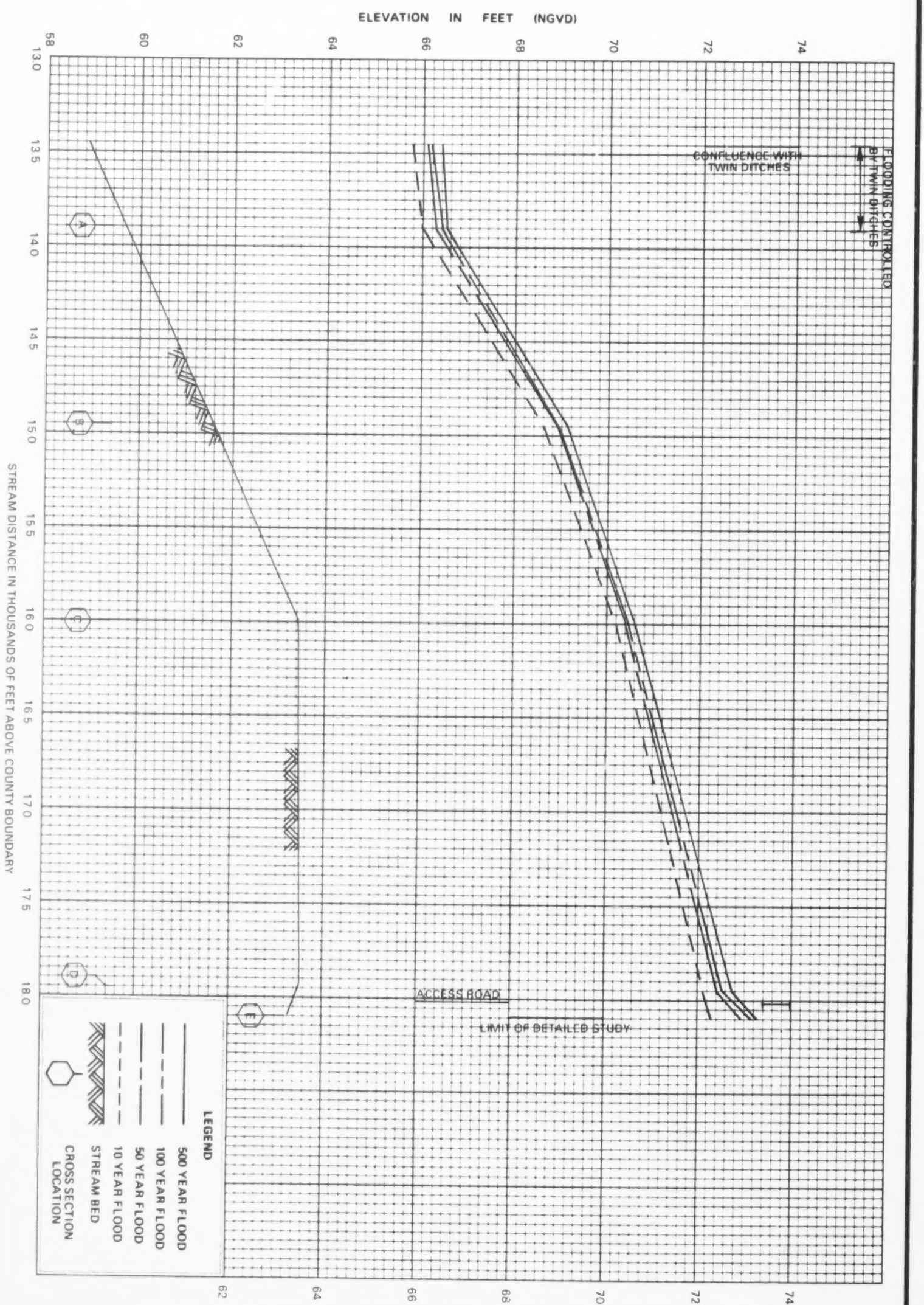
FLOOD PROFILES

TWIN DITCHES

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

92P



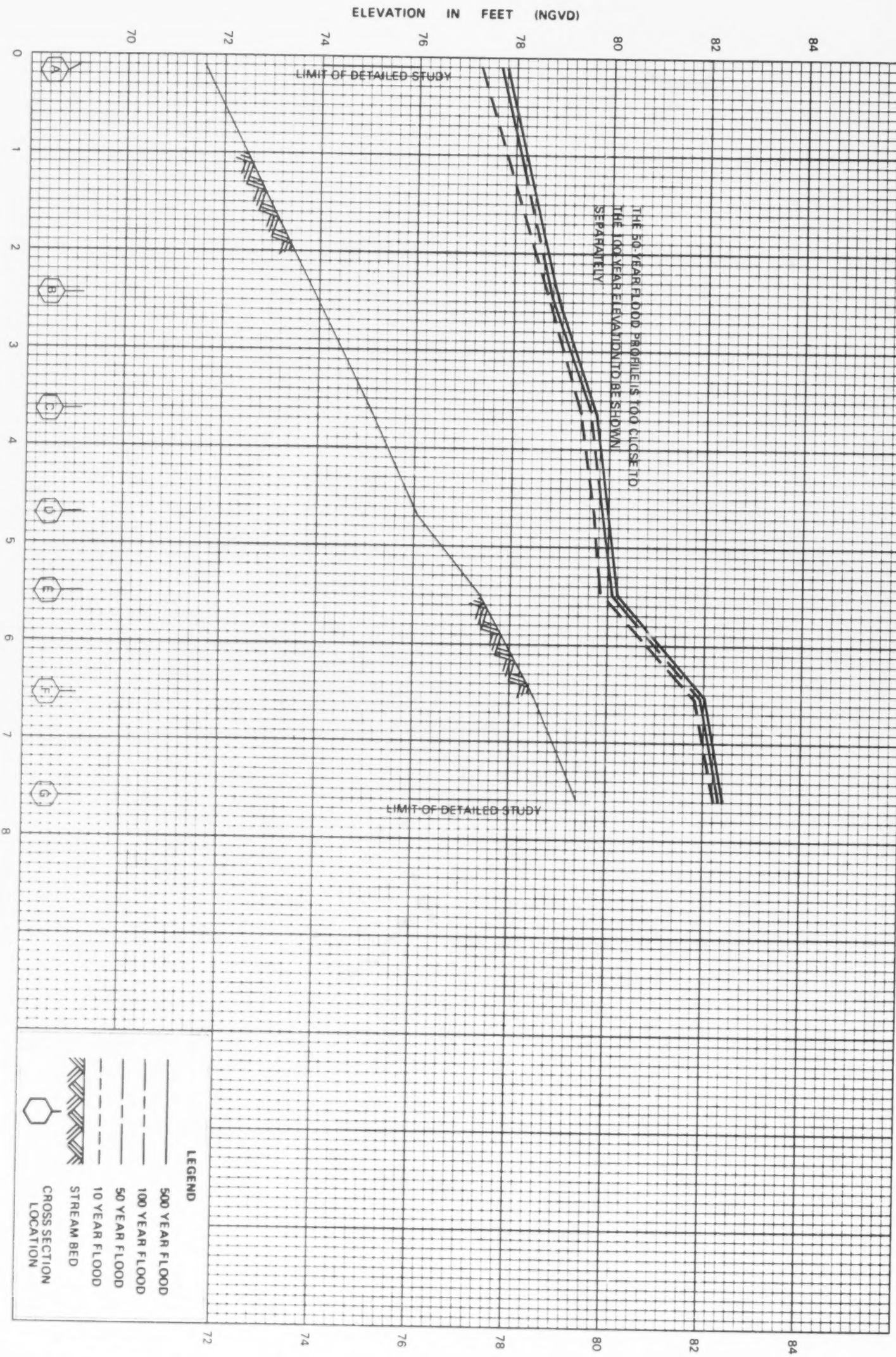
93P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

UPPER EAST-TWIN DITCH



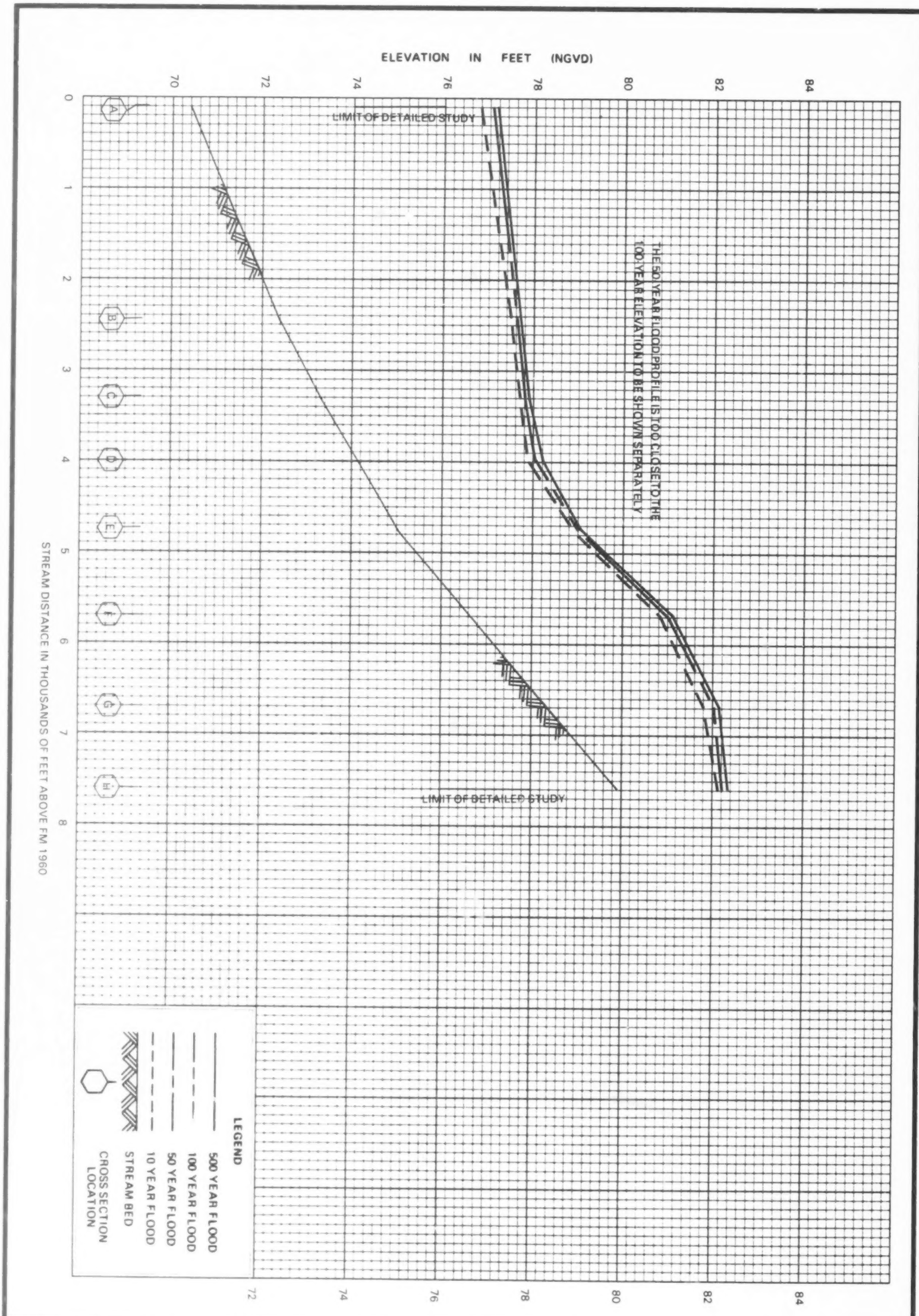
94P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST-WEST DAYTON DITCH



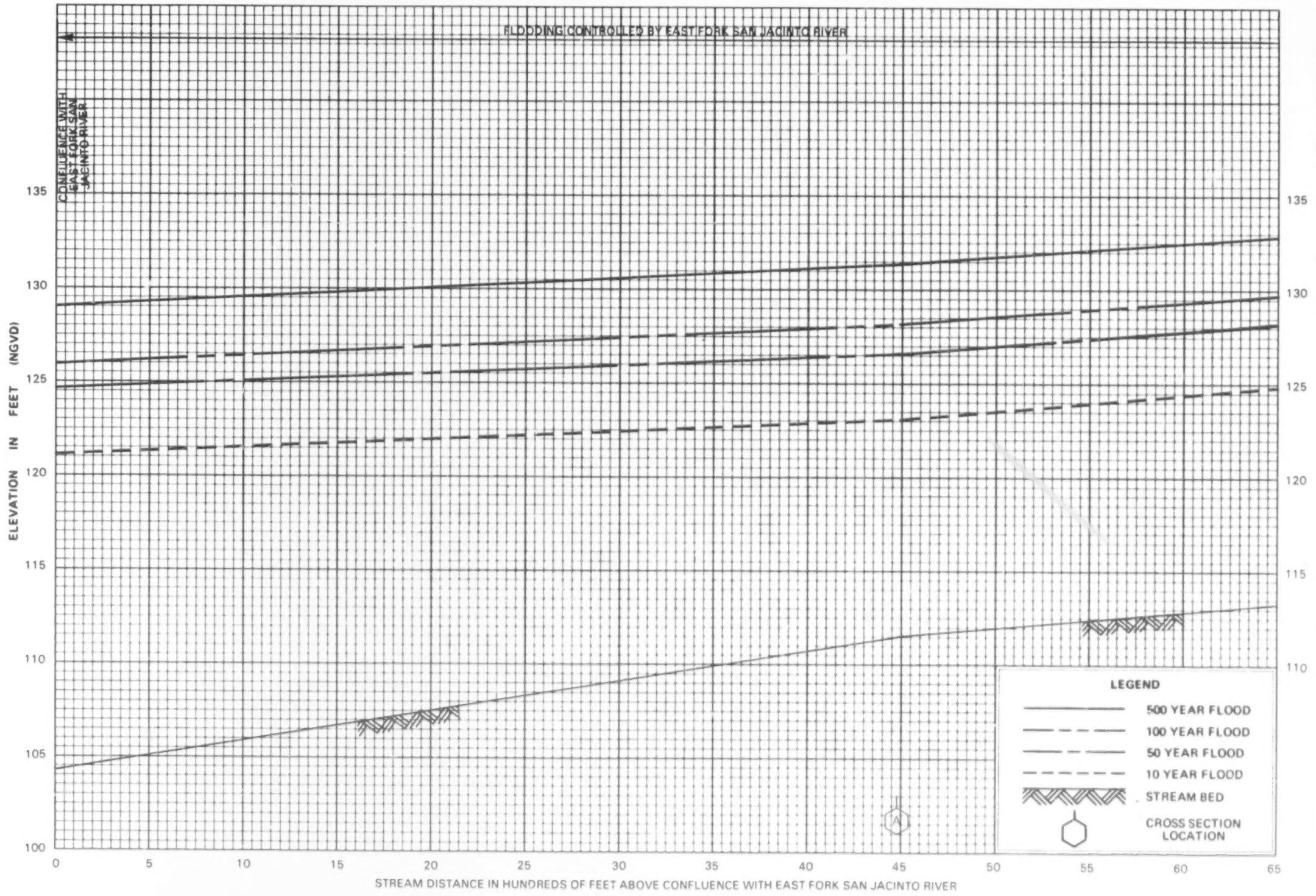
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

WEST-WEST DAYTON DITCH

95P



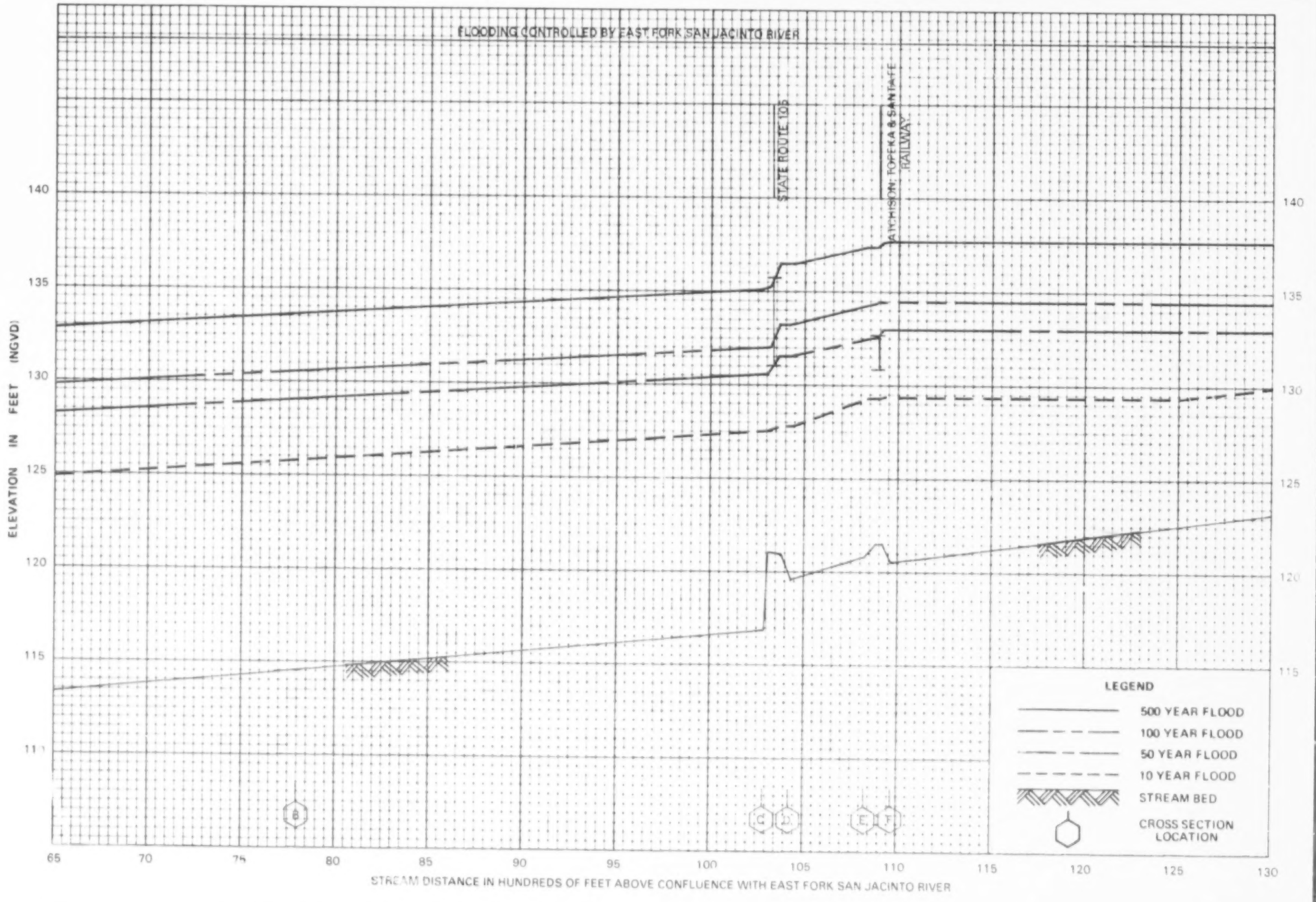
FLOOD PROFILES

WHISKEY BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

96P



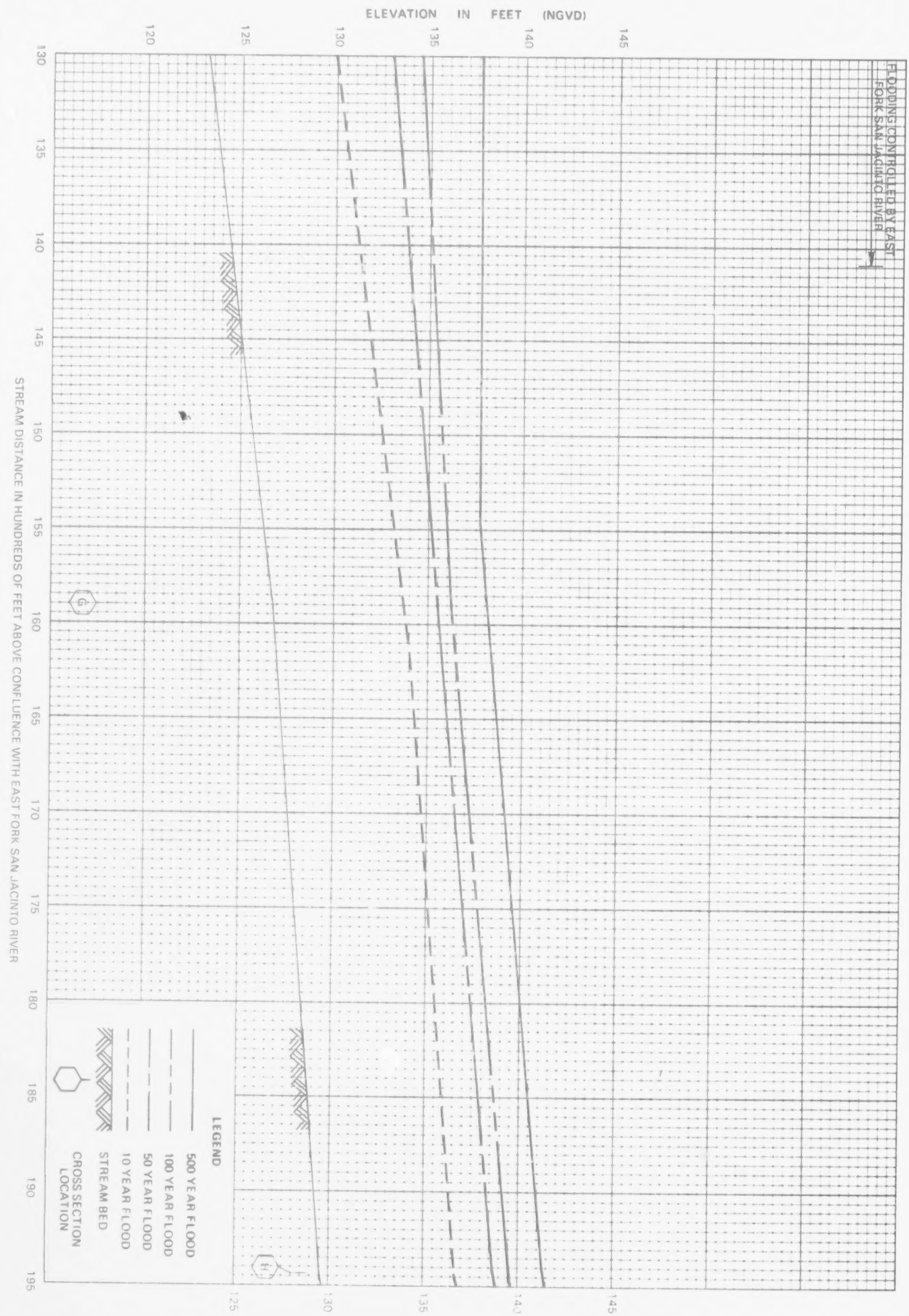
FLOOD PROFILES

WHISKEY BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

97P



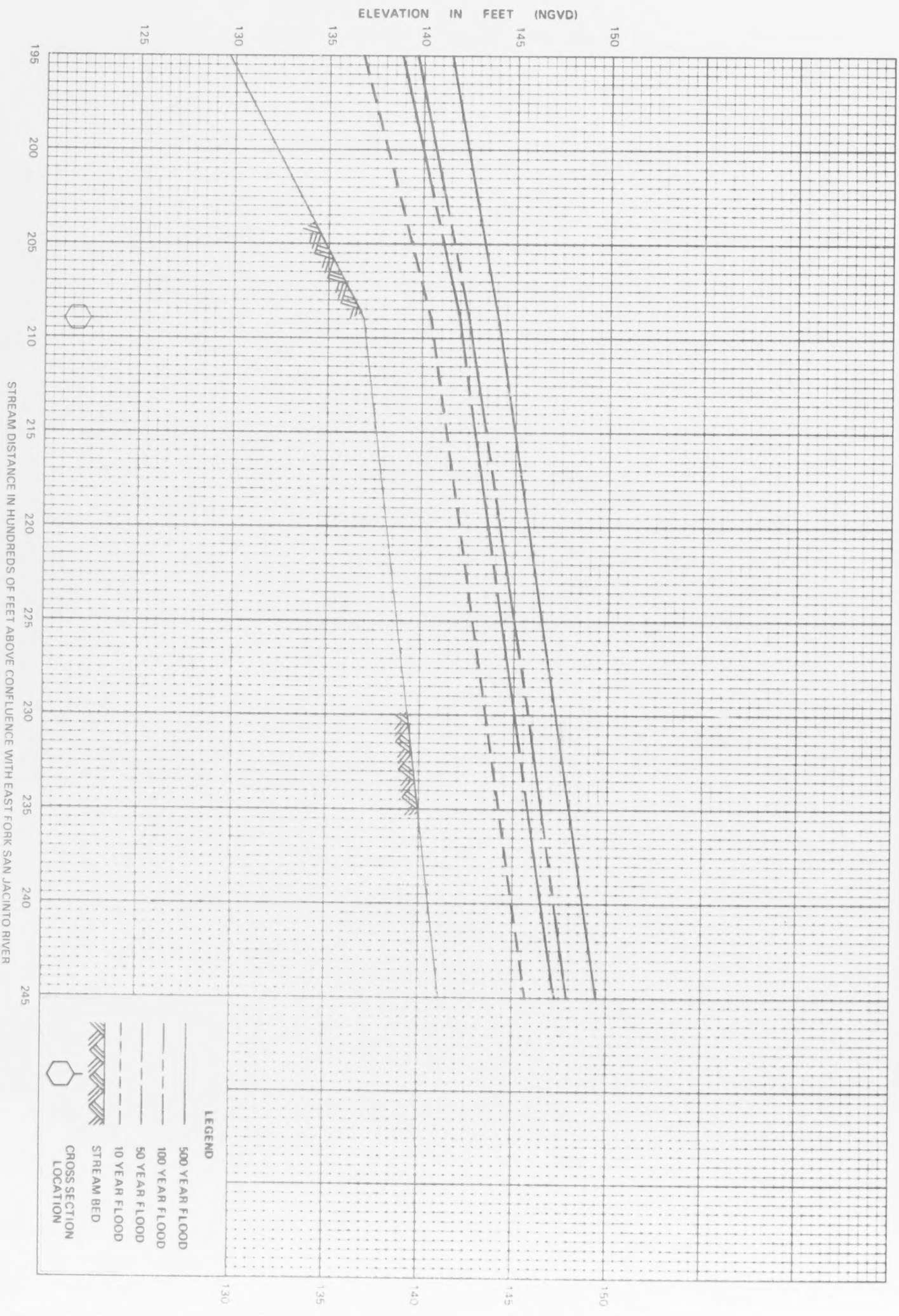
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

WHISKEY BRANCH

98P



99P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

WHISKEY BRANCH

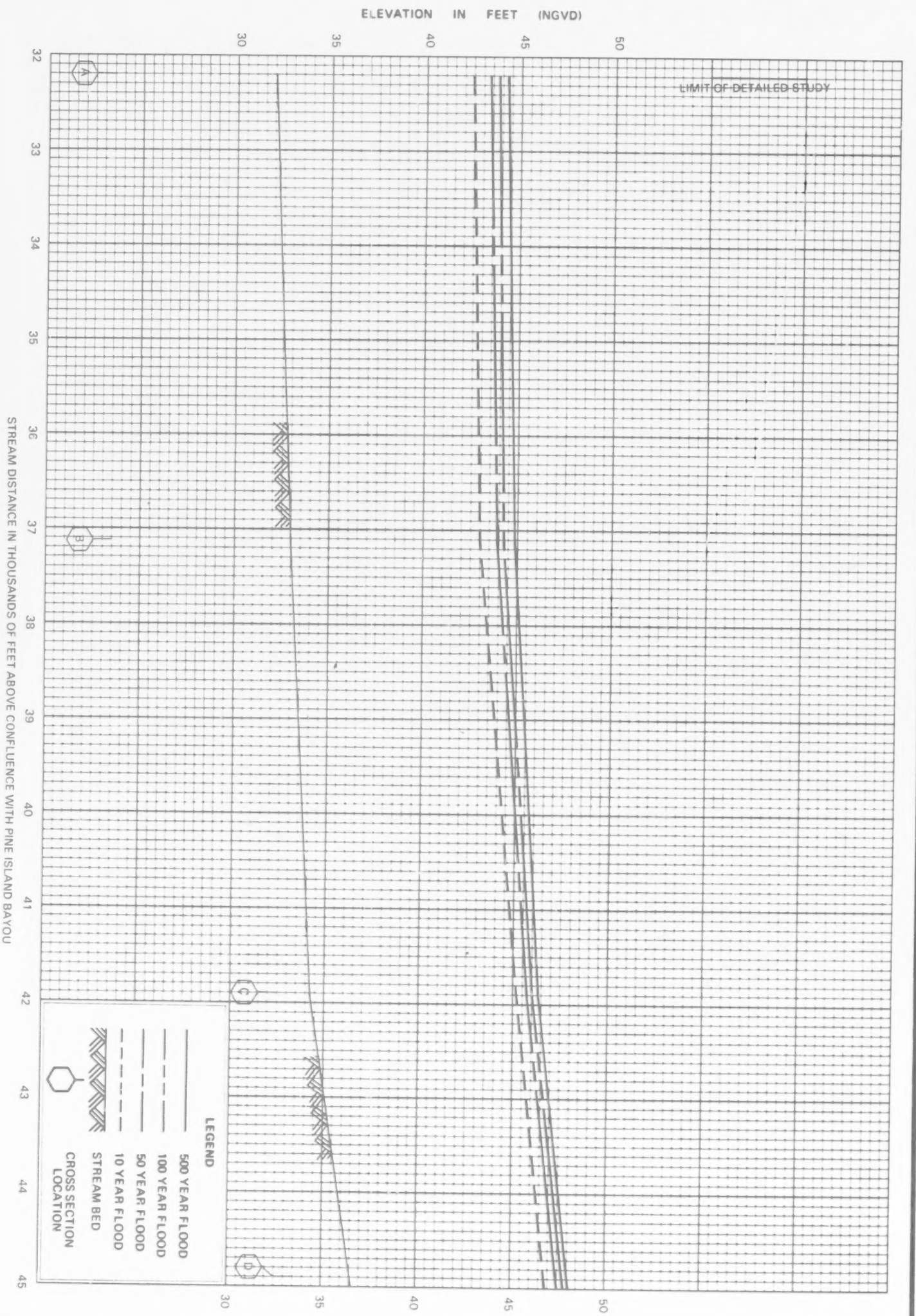
100P

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

WHISKEY BRANCH



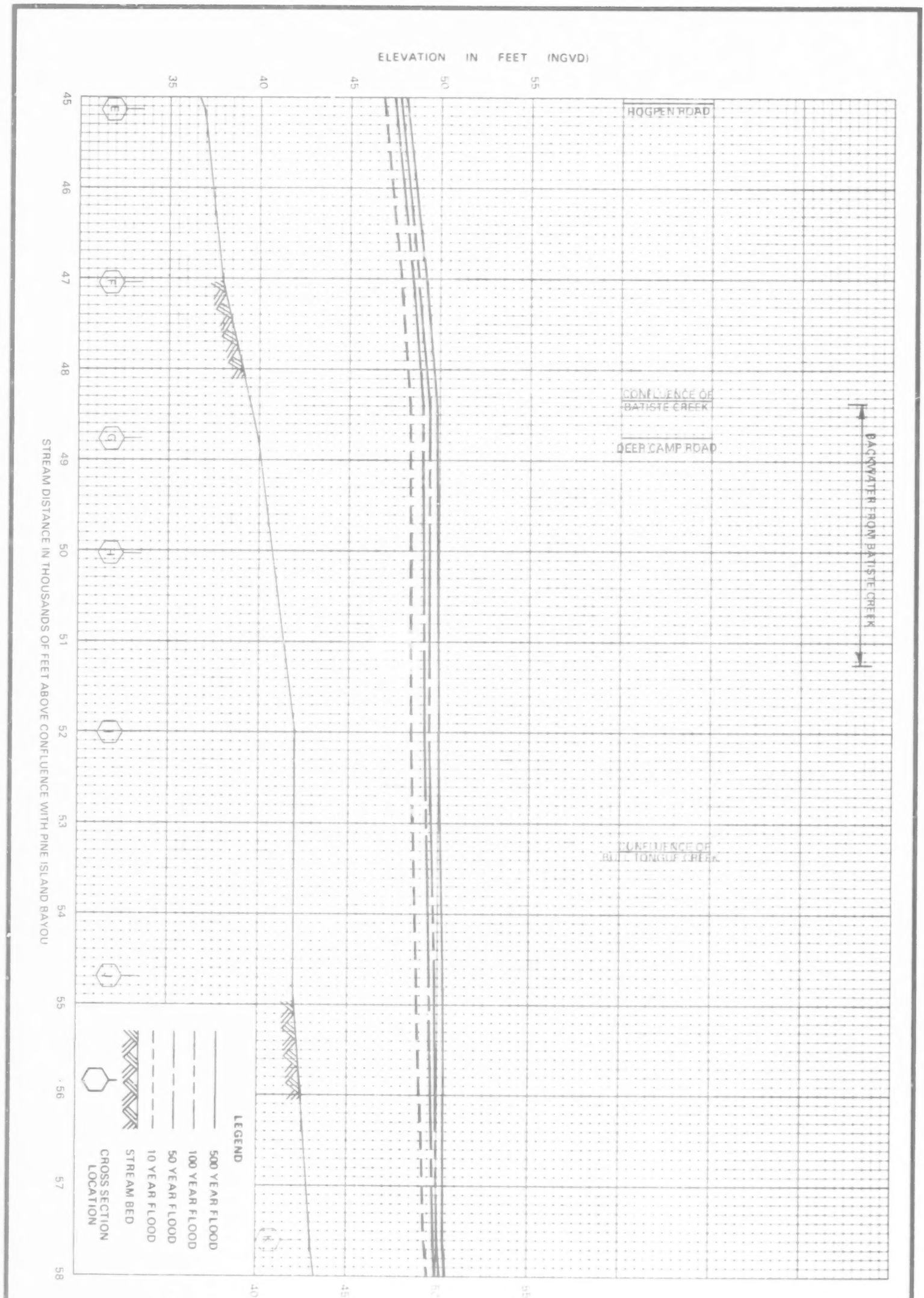
FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

FLOOD PROFILES

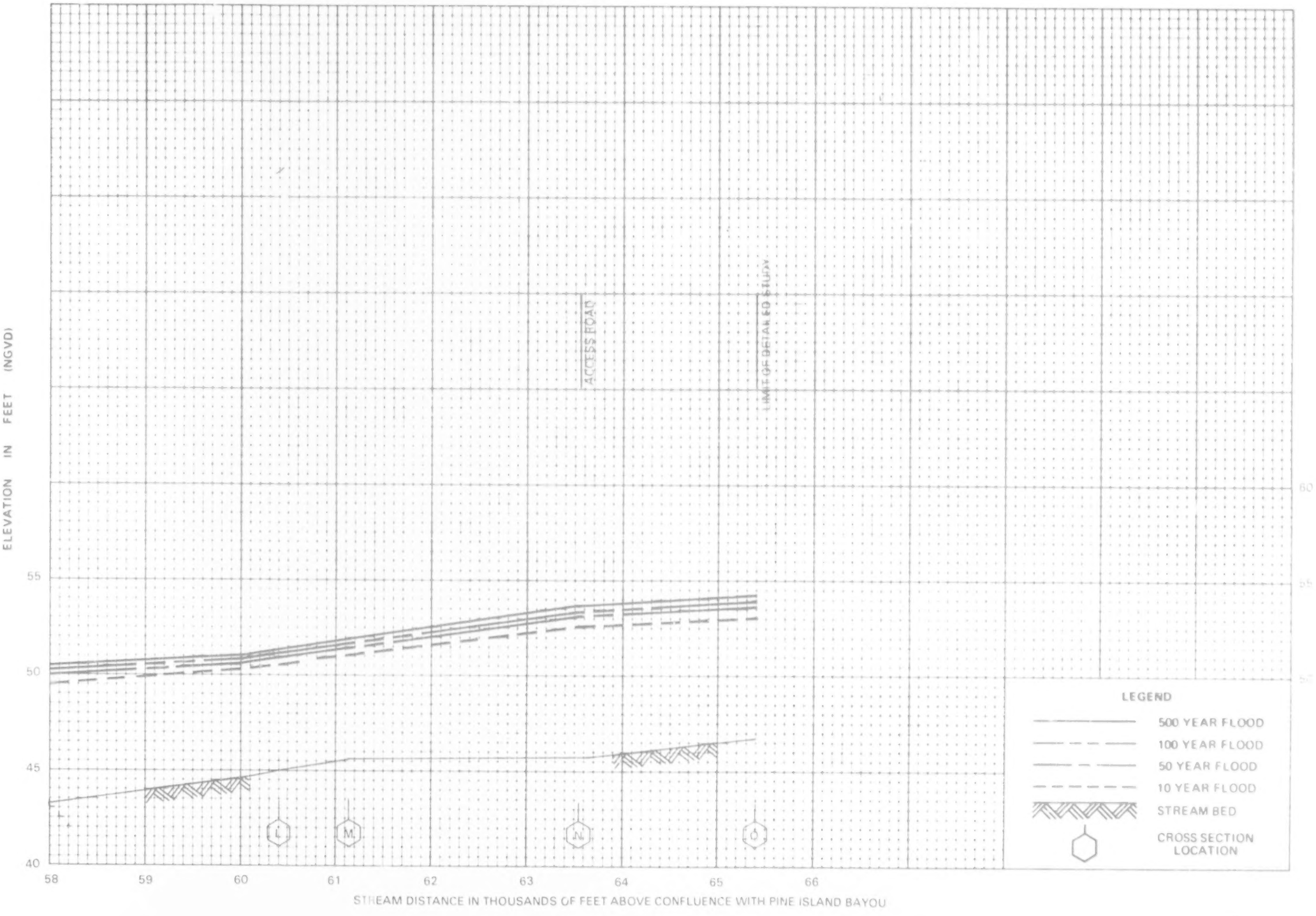
WILLOW CREEK

101P



62

102P	FEDERAL EMERGENCY MANAGEMENT AGENCY LIBERTY COUNTY, TX (UNINCORPORATED AREAS)	FLOOD PROFILES WILLOW CREEK



FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LIBERTY COUNTY, TX
(UNINCORPORATED AREAS)

103P